Technical Memorandum

South Placer Regional Wastewater & Recycled Water Systems Evaluation Project

Subject: Proposed 2005 Regional Service Area Boundary - FINAL

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Date: January 13, 2005

Reference: 091-4.01

I. INTRODUCTION

The 1996 Wastewater Master Plan (1996 Master Plan) Environmental Impact Report (EIR) Service Area (Regional Service Area) boundary was established with the adoption of the 1996 Master Plan and associated EIR. The Regional Service Area, shown in Figure 1 of Attachment A, includes the City of Roseville, the South Placer Municipal Utilities District (SPMUD), and three unincorporated areas of Placer County: Sunset, Granite Bay (i.e. SMD-2), and Dry Creek/West Placer. SPMUD includes the City of Rocklin, the Town of Loomis, and portions of unincorporated Placer County, including the community of Penryn. In all, the Regional Service Area covers approximately 54,550 acres.

Since 1996, ten areas outside the service area have been annexed by the SPWA partner agencies. These areas are shown in Figure 1 as "House Keeping Areas." Eight of these areas have been annexed by South Placer Municipal Utility District (SPMUD) and two, the West Roseville Specific Plan and Pleasant Grove Wastewater Treatment Plant, have been annexed by the City of Roseville.

Three of the ten annexed areas are partially located within the Regional Service Area. These areas include portions of the West Roseville Specific Plan, Loomis Hills Estates, and the Sierra College annexations. Annexed areas, which are located outside the Regional Service Area, total approximately 3,277 acres as presented in Table 1. As part of this South Placer Regional Wastewater & Recycled Water Systems Evaluation Project (Project), the South Placer Wastewater Authority (SPWA) partner agencies would like to revise the Regional Service Area boundary to encompass all the annexed areas which are located outside Regional Service Area. With the proposed revisions, the Regional Service Area would then cover approximately 57,827 acres as shown in Figure 2 of Attachment A.

This technical memorandum (TM) presents a summary of the California Environmental Quality Act (CEQA) compliance references and a regional treatment capacity assessment based on up to date estimated unit flow factors for the current service area. The existing CEQA documentation combined with information provided in this TM constitutes the necessary background documentation for revising the Regional Service Area boundary to include the ten annexation areas.

This TM is organized as follows:

I. Introduction
II. Annexation Areas and CEQA Compliance
III. Wastewater Treatment Capacity Assessment
IV. Conclusions

II. ANNEXATION AREAS AND CEQA COMPLIANCE

The ten annexation areas to be included in the proposed Regional Service Area boundary revision are listed in Table 1. Table 1 also shows the effective date of the Local Agency Formation Commission (LAFCO) action for lead agency approval, the type of (CEQA) documentation prepared for each project, the total acreage of each project, and the acres outside of the existing Regional Service Area boundary. All of the annexations have been approved by their respective Lead Agencies. Loomis Hills Estates has been approved by the Town of Loomis, and is already within the town limits, but is in the process of having the entire project area annexed into the SPMUD's service area.

Table 1: Annexation Areas Considered for Inclusion in Regional Service Area

No.	Project Name	Service Provider	LAFCO Effective Date	CEQA Compliance	Total Project Acres	Acres Outside of the Regional Service Area Boundary
1	West Roseville Specific Plan Area	City of Roseville	8/18/2004	EIR	3,162	1,966
2	Pleasant Grove Wastewater Treatment Plant	City of Roseville	4/18/2001	EIR	180	180
3	Clover Valley Lakes	SPMUD	2/26/1998	EIR	642	642
4	Loomis Hills Estates	SPMUD	Pending	EIR	322	202
5	Sierra College	SPMUD	5/1/2003	Negative Declaration	375	244
6	Poppy Ridge	SPMUD	4/19/2004	Negative Declaration	20	20
7	Clark Powers Elem. School	SPMUD	3/14/2003	Exemption	10	10
8	Miller Annexation	SPMUD	9/24/2004	Exemption	10	10
9	Reyneveld Annexation	SPMUD	2/27//2003	Exemption	3	3
10	Cook Annexation	SPMUD	3/2/2004	Negative Declaration	0.1	0.1
				Total	***4,724***	***3,277***

III. WASTEWATER TREATMENT CAPACITY ASSESSMENT

In the CEQA documentation prepared for each annexation area, the effects on the sewer service provider were considered. For the projects that received an exemption, no discernible effect was identified. For the other projects, it was determined that sewer service was available. However, only the West Roseville Specific Plan and Pleasant Grove Wastewater Treatment Plant EIRs considered in detail the possible cumulative impacts of the project with respect to all potential development projects on the ultimate planned treatment capacity of SPWA per the 1996 Master Plan. As such, a supplemental assessment was conducted for the SPMUD service area annexations as part of this Technical Memorandum.

According to personal communication with Richard Stein of SPMUD on December 15, 2004, the eight annexation projects within SPMUD's service area generate wastewater in the amount of approximately 1,100 Equivalent Dwelling Units (EDUs) in excess of those accounted for in the 1996 Master Plan. When annexed by the local jurisdiction with land use authority (e.g. City of Rocklin or Town of Loomis), and committed to service by SPMUD, CEQA documentation was provided. In order to verify the existing CEQA findings that these additional 1,100 EDUs will not rely on the capacity at the two

wastewater treatment plants (WWTPs) that were already effectively assigned to others under the 1996 Master Plan and EIR, an assessment of SPMUD's service area was performed. The results of this assessment demonstrate that, even with the inclusion of these 1,100 EDUs, the total flows estimated from SPMUD under the "build out" scenario would be less than what was previously assumed in the 1996 Master Plan as discussed below.

In Workshop #3 of this Project, the RMC team presented current data indicating that the unit flow rate of 260 gpd/du used in sizing treatment plant capacity in the 1996 Master Plan was higher than current monitored flows and water use records would indicate. The water use records and current monitored flows both indicated the unit flow rate to be approximately 230 gpd/du. The difference between these two unit flow rates provides an allowance for additional EDUs relative to the cumulative analysis of regional WWTP capacity (within the planning context of the 1996 Master Plan and EIR).

The 1996 Master Plan allocated a total of 44,017 equivalent residential dwelling units (single and multi-family) within the SPMUD service area at buildout.[1] With the 30 gpd/du difference between the two unit flow rates, this is equivalent to nearly 5,600 residential dwelling units that contribute 230 gpd/du. This far exceeds the 1,100 dwelling units in question. This data is presented in detail in Table 2.

Table 2: Unit Flow Factors, Estimated Flows and Associated EDUs at Buildout Conditions

Service Provider	Estimated EDUs at Buildout [a]	Estimated Flow per 1996 Master Plan [b] (mgd)	Estimated Flow per 2004 Proposed Unit Flow Factor [c] (mgd)	Excess Flow Difference (mgd)	Excess EDUs per 2004 Proposed Unit Flow Factor [d]
SPMUD	44,017	11.4	10.1	1.3	**5,600**

a. Per 1996 Master Plan
b. Estimated flow is calculated based on a unit flow factor of 260 gpd/edu used in the 1996 Master Plan for sizing treatment facilities.
c. 2004 estimated unit flow factor of 230 gpd/edu is based on 2004 temporary dry weather flow monitoring data for the SPWA area.
d. EDUs rounded downward to the nearest 100 to provide a conservative estimate.

IV. CONCLUSIONS

The addition of the ten annexation areas, shown in Figure 1 of Attachment A, would revise the Regional Service Area beyond the boundary adopted with the 1996 Master Plan. However, the results of the analysis presented above indicated that, from the standpoint of regional wastewater treatment capacity designed for development planned under the 1996 Master Plan, a reduction in actual estimated unit flow factors has resulted in treatment capacity for additional EDUs that would more than adequately compensate for the increase of 1,100 proposed dwelling units in the SPMUD service area.

The land use agencies for these ten projects have taken appropriate action, and have prepared documentation in accordance with CEQA. The projects have been annexed by the local sewer service provider, with the exception of Loomis Hills Estates, which is pending annexation into SPMUD. Lastly, the assessment discussed in this TM has shown that the inclusion of these annexed areas will not adversely impair the two treatment plants' ability to serve estimated future "build out" conditions in the Regional Service Area.

In the future, it is recommend that this planned regional treatment plant capacity evaluation/verification be conducted for individual annexations, as was done for the West Roseville Specific Plan, in order to verify that sufficient regional treatment plant capacity is planned for to meet these needs, or to allow for adequate time to plan for adjusting to these needs.

[1] From Table 1B of TM I-4 Supplemental Update of the 1996 Master Plan.

Attachment A

Existing and Proposed Regional Service Area Boundary Maps

South Placer Regional Wastewater and Recycled Water Systems Evaluation Project

Existing 1996 Service Area Boundary and "House Keeping Areas"

RMC

BROWN AND CALDWELL

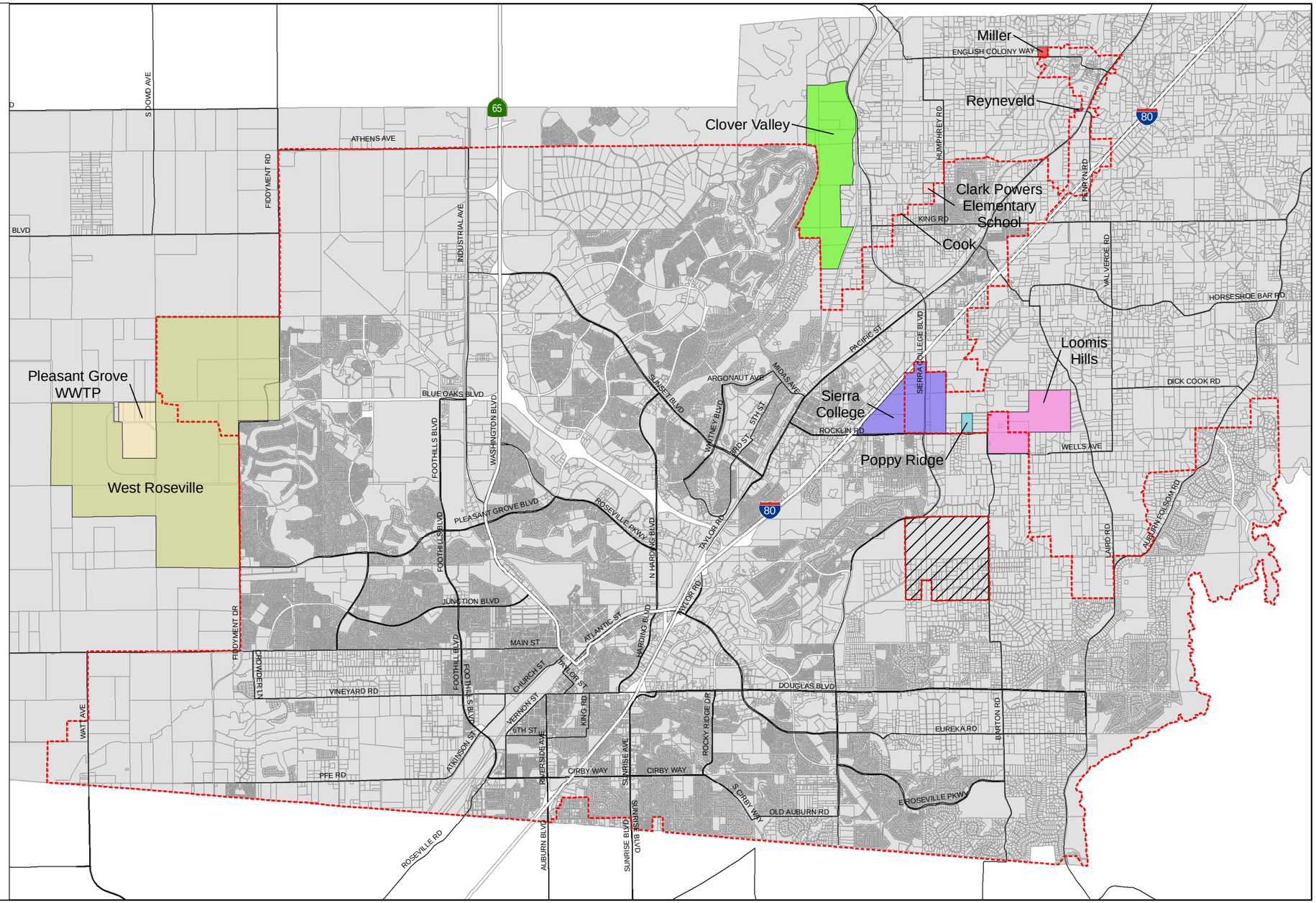
ESA Environmental Science Associates

House Keeping Areas

- Clover Valley
- Cook
- Sierra College
- Loomis Hills
- Miller
- West Roseville
- Poppy Ridge
- Reyneveld
- Clark Powers Elementary School
- Pleasant Grove WWTP
- Existing Service Area (1996)
- Not in Service Area
- Parcels

0 2

Miles



SOURCE: SPWA, 1996; ESA, 1996, 2004

Figure 1.0

Existing 1996 Service Area Boundary and "House Keeping Areas"

South Placer Regional Wastewater and Recycled Water Systems Evaluation Project

Proposed Service Area (2005)

RMC

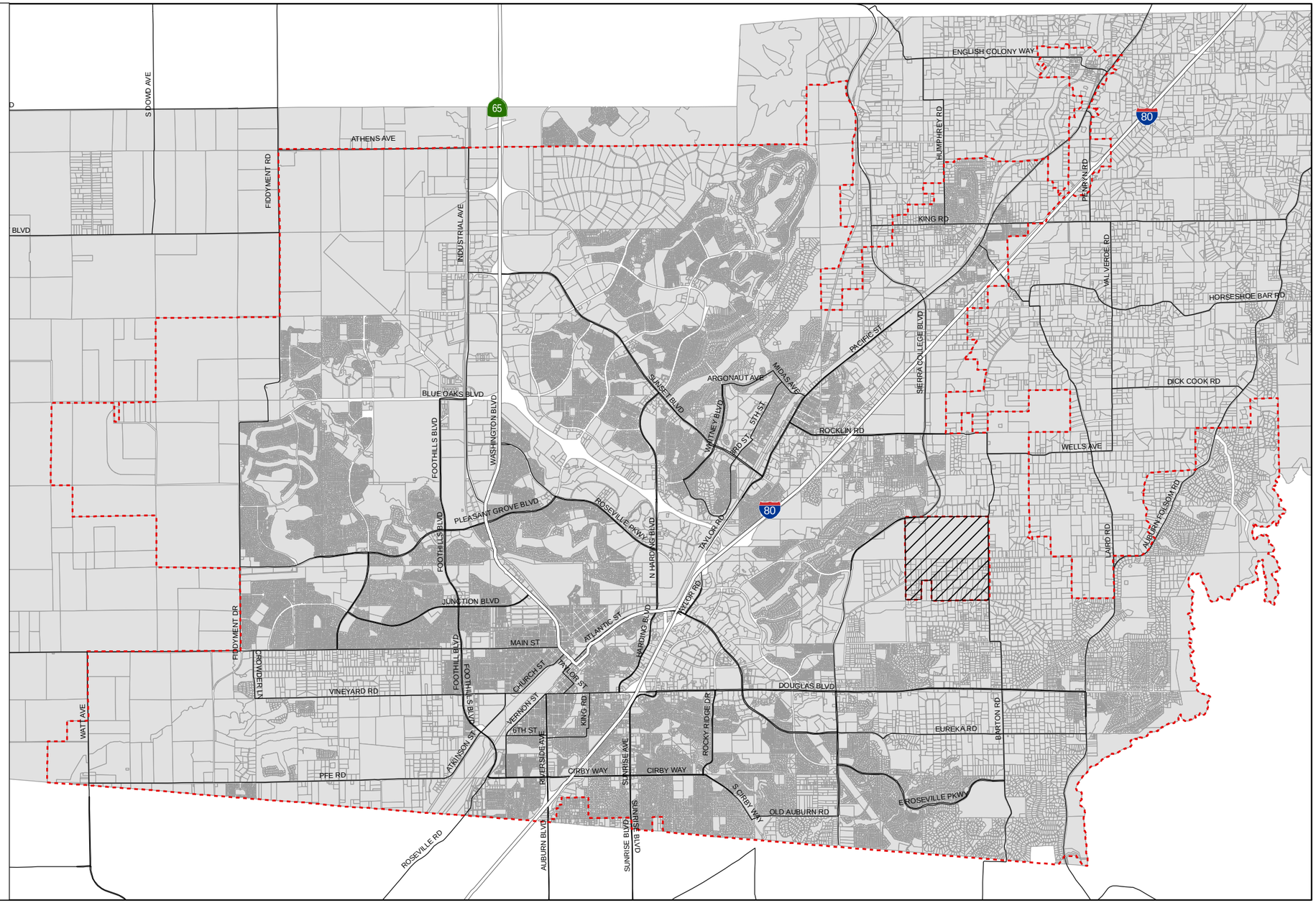
BROWN AND CALDWELL

ESA Environmental Science Associates

Proposed Service Area

Not in Service Area

Parcels



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Miles

SOURCE: SPWA, 1996; ESA, 1996, 2004

Figure 2.0

Proposed Service Area (2005)

Technical Memorandum

SOUTH PLACER WASTEWATER AUTHORITY (SPWA) WASTEWATER AND RECYCLED WATER SYSTEMS EVALUATION PROJECT

Subject:	**Dry Weather Flow Projection for the 2005 Proposed SPWA Service Area Technical Memorandum - FINAL**
Prepared For:	Art O'Brien – City of Roseville
Prepared by:	Pete Bellows/Chris Peters – Brown and Caldwell
Reviewed by:	Dave Richardson/Gisa Ju – RMC
Date:	October 21, 2005
Reference:	0091-004 Task 2

1 Introduction

This technical memorandum (TM) summarizes the dry weather wastewater flow (DWF) projections for existing and future conditions for the 2005 proposed SPWA service area boundary. DWF projections are used to:

1. Project flows for the analysis of the SPWA wastewater treatment plants
2. Identify changes in dry weather flow projections (within the 1996 Master Plan EIR Service Area) since the completion of the 1996 Wastewater Master Plan

2 Wastewater Flow Components

Typically, wastewater consists of three components: base sanitary flow (BSF), groundwater infiltration (GWI), and rainfall dependent infiltration and inflow (RDI/I). These components are shown on Figure 1. BSF and GWI during dry weather constitute DWF. Base sanitary flow is generated from residential, commercial, industrial, and public sources that discharge into the wastewater collection system. Base sanitary flow varies during the day in a diurnal pattern with the lowest flow during early morning hours when most people are asleep and businesses are closed, and the highest flow in mid-morning after people get ready for their day's activities. GWI occurs when groundwater levels are above the inverts of the collection system pipes and when the collection system has faulty joints or other defects that allow infiltration. RDI/I occurs during wet weather conditions and causes the wastewater flow to increase. RDI/I is discussed in a separate TM.

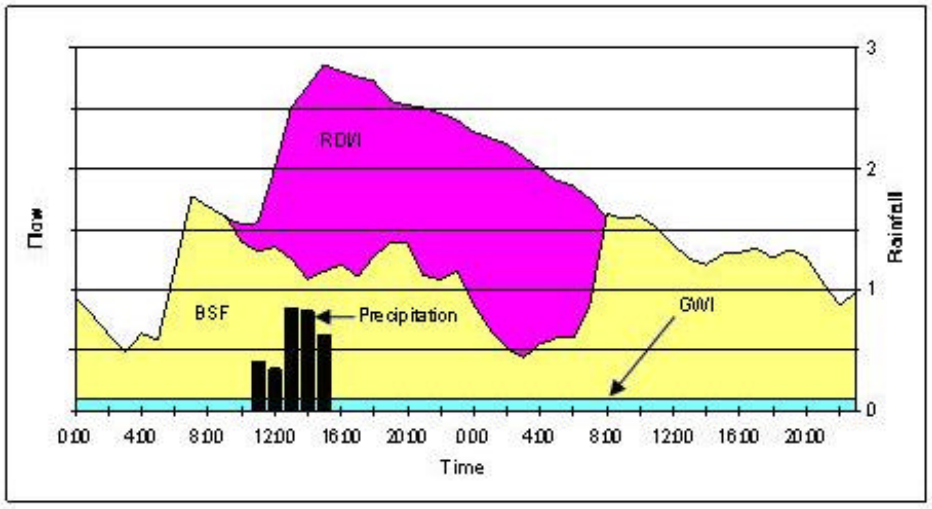


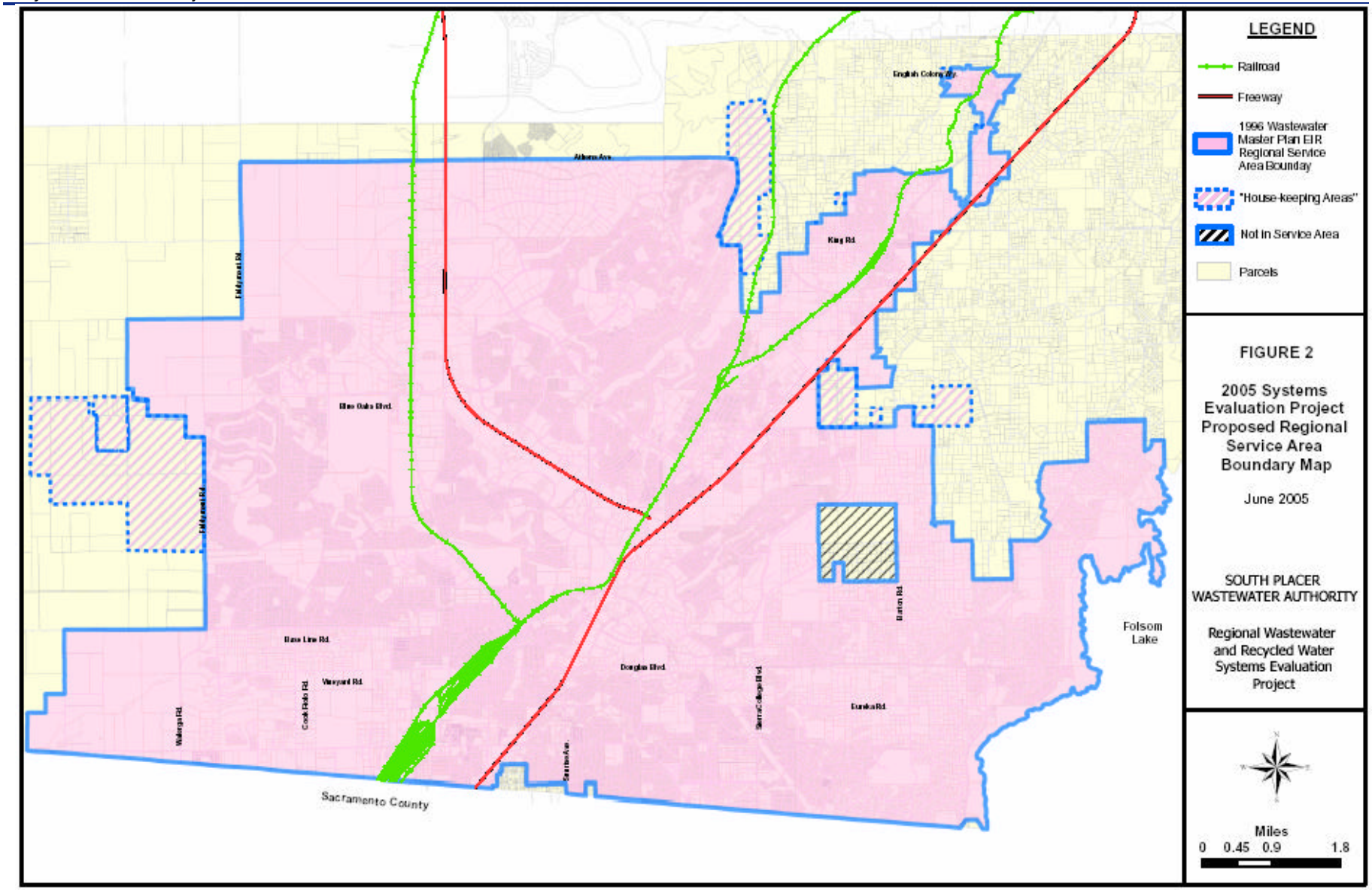
Figure 1 Wastewater Components

For this project, DWF is projected on a parcel-by-parcel basis using unit BSF and GWI factors. Land use information is summarized in the Land Use TM. Development of unit BSF and GWI factors is discussed below. Individual large or atypical dischargers (customers) were identified and their BSF was projected individually based on historical data.

3 Land Use

A parcel-based land use map of the proposed 2005 SPWA service area was developed for this project from specific plan and county assessor's data provided by the City of Roseville and Placer County. The 1996 Wastewater Master Plan Environmental Impact Report service area boundary (Regional Service Area) was revised and existing land use information was assigned to each parcel within the revised Regional Service Area. The process used to revise the Regional Service Area is documented in the January 2005 TM (TM No. 1a) entitled "Proposed 2005 Regional Service Area Boundary". A map of the Proposed 2005 Regional Service Area is included as Figure 2. Development of the land use map (current and future), land use code designations, and connected land use is documented in the forthcoming (October 2005) Land Use TM (TM No. 1b).

The land use map and associated database was developed for this project solely to project wastewater flows. This information should not be used for other purposes without consulting the City of Roseville and SPWA.


LEGEND
Railroad
Freeway
1996 Wastewater Master Plan EIR Regional Service Area Boundary
"House-keeping Areas"
Not In Service Area
Parcels
FIGURE 2
2005 Systems Evaluation Project Proposed Regional Service Area Boundary Map
June 2005
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Systems Evaluation Project
Miles
0 0.45 0.9 1.8
Folsom Lake
Sacramento County
Auburn Ave
King Rd
Blue Oaks Blvd
Base Line Rd
Douglas Blvd
Eureka Rd
Dalton Rd
Sierra College Blvd
Walerga Rd
Cook Riolo Rd
Vineyard Rd
Fiddyment Rd

3.1 Land Use Designations

The team consolidated approximately 114 land use codes previously used by the City of Roseville and Placer County into 17 new land use codes. Those 17 land use codes were further consolidated into 11 land use codes to simplify the process of projecting current and future wastewater flows in the model. Part 2 of the consolidation process aggregated the non-flow producing land use types into one "Open Space" category and introduced three new land use codes (Mixed Use, Schools, and Parks > 10 Acres). Parks were consolidated into the Open Space category with the exception of those parks greater than 10 acres in size. This was done so that these larger parks (typically with restroom facilities) could be accounted for in the flow projections.

3.2 Current Land Use and Connected Parcels

Parcels that are currently connected to the SPWA collection system were identified to project current wastewater flow and calibrate the sewer model for the existing system. Further discussion on the identification of connected parcels is presented in the Land Use TM.

3.3 Future Land Use

The future land use is based on buildout within the proposed 2005 Regional Service Area as shown on the Land Use Map. For the future condition, all parcels are considered to be connected to the wastewater collection system even though some land uses in the "Open Space" category do not generate wastewater.

Current and future land use acreages for connected parcels within the proposed 2005 Regional Service Area are summarized by land use designation in Table 1 and Table 2.

There are currently 22,159 connected acres within the existing Regional Service Area. Approximately 67 percent of the developed land is currently classified as single or multi-family residential. Approximately 10 percent of the developed land is currently classified as open space.

Table 1 - Current Land Use Summary within the Proposed 2005 Regional Service Area

Land Use Designation	Current Connected Area (Acres)		Total Current Connected Area (Acres)
	Pleasant Grove Watershed	Dry Creek Watershed	
Commercial	495	1,622	2,117
Heavy Industrial	364	111	475
Light Industrial	616	316	932
Mixed Use	0	7	7
Open Space	1,398	737	2,135
Parks > 10 Acres	247	263	510
Public/Quasi-Public	154	467	621
Residential 1 DU	4,186	9,343	13,529
Residential 2 DU	0	280	280
Residential 3 DU	0	37	37
Residential Multiple DU	380	547	927
Schools	171	418	589
Total Acreage	**8,011**	**14,148**	**22,159**

Table 2 – Buildout Land Use Summary within the Proposed 2005 Regional Service Area

Land Use Designation	Buildout Connected Area (Acres)		Total Future Connected Area (Acres[1,2])
	Pleasant Grove Watershed[1]	Dry Creek Watershed[2]	
Commercial	2,111	2,915	5,026
Heavy Industrial	1,714	263	1,977
Light Industrial	1,598	637	2,235
Mixed Use	27	30	57
Open Space	7,320	3,546	10,866
Parks > 10 Acres	270	360	630
Public/Quasi-Public	323	877	1,200
Residential 1 DU	7,700	18,798	26,498
Residential 2 DU	0	839	839
Residential 3 DU	9	366	375
Residential Multiple DU	727	647	1,374
Schools	376	550	926
Total Acreage	**22,175**	**29,828**	**52,003**

1 Includes portion of Placer Ranch UGA within the proposed 2005 service area.

2 Includes portion of Placer Vineyard UGA within the proposed 2005 service area.

The 2005 Regional Service Area includes portions of two Urban Growth Areas (UGAs), the remainder of which are outside both the 1996 Service Area and the 2005 Regional Service Area. Projected flows from UGA's will be the subject of a future TM, Dry Weather Flow Projections for the 2005 Proposed SPWA Service Area and UGA's. The 2005 Regional Service Area also includes "Housekeeping Areas", areas discussed in TM No. 1a. The largest of those "housekeeping areas" is the West Roseville Specific Plan. Information about proposed development within the Placer Vineyard and Placer Ranch UGAs and West Roseville was obtained from Specific Plans and discussions with developers. The UGAs and West Roseville are currently comprised of several large parcels that have not been subdivided to reflect the proposed future developments. Flow projections from these areas are based on the proposed number of dwelling units, land use acreages, and unit BSF and GWI factors discussed below.

4 Point Sources

Eight point sources were identified for the sewer evaluation based on discussions with SPWA member agencies. Information about point sources is summarized in Table 3. Point sources were identified from flow monitoring and water billing information. The Landfill was also identified as a point source because it generates very little wastewater flow in comparison to its land area. Future flow projections from NEC and HP were provided by the City of Roseville and are based on buildout conditions for each development.

Table 3 - Current and Projected DWF from Point Sources in the Proposed 2005 Service Area

Point Source	Location	Current Flow Data Source	Current DWF (gpd)	Projected Buildout DWF (gpd)
Union Pacific Railroad	Roseville	City of Roseville	85,000	85,000
Landfill	Placer County	City of Roseville	5,000	5,000
NEC	Roseville	Flow Monitor Data	700,000	2,000,000
HP	Roseville	City of Roseville	150,000	484,000
Kaiser Hospital	Roseville	Water Use Data	50,000	50,000
Formica	Placer County	Placer County	60,000	60,000
Rio Bravo Power Plant	Placer County	Placer County	15,000	15,000

Notes: Flow projections are based upon existing land use and existing land use designations current as of June, 2004, and will provide the estimated flows for baseline modeling scenario for SPWA. Rezoning of HP and Kaiser Hospital properties are now better known than in June 2004, and will be documented in TM No. 9b, and will be included in a "Land Use intensification Scenario".

5 Base Sanitary Unit Flow Factors

Unit BSF factors were developed using the following sources of data:

- City of Roseville Water Billing Data
- Temporary Dry Weather Flow Monitoring Data from selected locations in the SPWA Service Area
- Permanent Flow Monitoring Data from Pleasant Grove and Dry Creek WWTPs
- Permanent Flow Monitoring Data from collection system meters serving SPMUD and Placer County

The basic approach utilized to develop the unit flow factors included gathering and analyzing land use-specific water billing and flow monitoring data and then testing the resulting unit factors for the existing system in a mass balance.

5.1 Roseville Water Billing Data

Unit flow factors were developed from City of Roseville water billing information from December 2003 – March 2004. Water billing data was available for approximately 50 percent of the parcels in Roseville. Water billing information was joined to the parcels in the land use database by Assessor Parcel Number (APN). The parcel database includes land use information that allowed water usage information to be grouped by land use designation. Winter water usage information was primarily evaluated since landscape irrigation is minimal during winter months and water usage is more closely related to wastewater flows. These water demand factors can be correlated to BSF unit flow factors. Historically, BSF is typically 80-90 percent of water demand. This process yielded the following results, presented in Table 4.

Table 4 - Water Demand Factors Derived from the Roseville Water Billing Data

Land Use Designation	Water Demand Factor		Typical Base Sanitary Flow Factor Range[1]	
Commercial	1,000	gpd per acre	800-900	gpd per acre
Heavy Industrial	310	gpd per acre	250-280	gpd per acre
Light Industrial	1,000	gpd per acre	800-900	gpd per acre
Mixed Use	2,700	gpd per acre	2,160-2,430	gpd per acre
Public/Quasi-Public	780	gpd per acre	620-700	gpd per acre
Schools	200	gpd per acre	160-180	gpd per acre
Single Family Residential	220	gpd per du	180-200	gpd per du
Residential Multiple DU	1,500	gpd per acre	1,200-1,350	gpd per acre

[1] 80 to 90 percent of the Water Demand Factor

5.2 Temporary Dry Weather Flow Monitoring

Temporary dry weather flow monitoring was conducted at 16 sites for 24 days in September and October 2004. These sites were located in Roseville, Placer County and SPMUD sewer service areas. The intent of this flow monitoring was to isolate single land use types so that unit flow factors could be determined for each monitored land use.

As would be expected in a collection system with diverse development ages and types, the unit flow factors varied widely within each land use category. The reason for this variation is due to the fact that the data is only representative of a very small sample of parcels within the service area. For example, the monitored residential parcels represent approximately 5 percent of the total residential parcels within the study area. These results were used in conjunction with the water use data presented in the previous section. Specific details and information about the temporary dry weather flow monitoring is presented in the October 2005 Flow Monitoring TM (No. 2d).

5.3 Permanent Dry Weather Flow Monitoring

Dry weather flow monitoring data from seven permanent flow monitoring sites in Roseville, SPMUD and Placer County were reviewed to establish "target" flows for the unit flow factor mass balance. Flow data from September and October 2004 was provided by Roseville, SPMUD and Placer County. A flow data summary is presented in Table 5. The two sites in Roseville were located at each wastewater treatment plant (WWTP). The five remaining sites were located at flumes where SPMUD and Placer County trunk sewers enter Roseville. The flow monitors in the Dry Creek watershed are tributary to the Dry Creek WWTP. The flow monitors in the Pleasant Grove watershed are tributary to the Pleasant Grove WWTP. Hydrographs for the Springview, Strap Ravine and Old Auburn flow monitoring sites exhibited signs of GWI. This was confirmed during the unit flow factor mass balance procedure and a review of temporary wet weather flow monitoring data from Winter 2005.

6 Groundwater Infiltration (GWI)

GWI occurs when groundwater levels are above the inverts of the collection system pipes and manholes and the pipes and manholes have leaky joints or other defects that allow groundwater to enter the collection system. Groundwater levels vary seasonally and are highest at the end of the wet season and

lowest at the end of the dry season, which is typically in September. Higher GWI levels that may occur during wet weather will be addressed in the Wet Weather Flow Projection TM (No. 2c).

Total GWI is estimated by subtracting total BSF projections from total DWF as measured at each WWTP flow monitoring site. The total calculated GWI rate for the service area is approximately 1.70 mgd. For purposes of WWTP expansion planning, the GWI will be distributed evenly across the entire service area. For purposes of collection system modeling, the GWI will be distributed spatially based on the results of the flow monitoring data analysis.

Table 5 - Measured Flow at 2004 Permanent Dry Weather Flow Monitoring Sites, and Estimated GWI from Watershed Lands Upstream of Meter

Site Name	Location	Watershed	BSF (mgd)	GWI (mgd)	DWF (mgd)
Old Auburn	Placer County	Dry Creek	0.75	0.50	1.25
Strap Ravine	Placer County	Dry Creek	0.73	0.30	1.03
Highlands	SPMUD	Dry Creek	0.08	0.00	0.08
Springview	SPMUD	Dry Creek	2.19	0.80	2.99
Dry Creek WWTP	Roseville	Dry Creek	12.70	1.70	14.40
North Roseville	SPMUD	Pleasant Grove	1.84	0.00	1.84
Pleasant Grove WWTP	Roseville	Pleasant Grove	2.55	0.00	2.55

7 Unit Flow Factor Mass Balance

Unit flow factors from the water data and temporary flow data analysis were used as a starting point to balance the wastewater flows with the permanent flow meter sites. Flow projections for the WWTP analysis are based on unit DWF factors which include BSF and GWI. This provides a uniform methodology for projecting flows throughout the service area.

Utilizing the total DWF observed at the Roseville WWTPs (without subtracting GWI), the most representative DWF unit flow factor set was approximately 85 percent of the winter water use, with the exception of Residential Multiple DU and Heavy Industrial, which are explained below.

The Residential Multiple DU unit flow rate of 2,040 gpd/acre is based on an estimated unit flow factor of 130 gpd per multi-family dwelling unit (which is approximately 70 percent of the wastewater flow of single-family dwelling units) with a development density of 16 units per acre. Multi-family dwelling units typically have fewer occupants than single-family dwelling units and therefore generate less wastewater. The development density of 16 units per acre is the average number of Residential Multiple DU dwelling units/acre in Roseville and SPMUD.

The Heavy Industrial unit flow factor of 250 gpd/acre appeared to be extremely low compared to the Light Industrial unit flow factor and typical Heavy Industrial unit flow factors seen in other cities. Because of this difference, the Heavy Industrial unit flow rate was modified to match the Light Industrial unit flow factor. In the future, any proposed Heavy Industrial land use will be evaluated on the basis of the type of proposed use (eg. Wet industry, or Dry Industry) and the site specific flow associated with any development or planning proposal.

The current DWF mass balance (including GWI) for the proposed 2005 SPWA service area is presented in Table 6. This projection is within 2 percent of the average total flow of 16.99 mgd measured at Dry Creek and Pleasant Grove WWTPs in September and October 2004.

Table 6 - Current Dry Weather Flow Mass Balance

Land Use	Unit Flow Factor		Current Units (Acres or DU)	Current DWF (mgd)
Commercial	850	gpd per acre	2,117	1.79
Heavy Industrial[1]	850	gpd per acre	475	0.40
Light Industrial[1]	850	gpd per acre	932	0.79
Mixed Use	2,300	gpd per acre	7	0.02
Public/Quasi-Public[1]	660	gpd per acre	621	0.41
Schools	170	gpd per acre	589	0.10
Residential 1 DU	190	gpd per du	51,285	9.74
Residential 2 DU	190	gpd per du	1,537	0.30
Residential 3 DU	190	gpd per du	306	0.06
Residential Multiple DU	2,040	gpd per acre	927	1.89
Open Space	0	gpd per acre	2,135	0.00
Parks > 10 Acres	10	gpd per acre	510	0.005
Point Sources		varies	1,139	1.16
Total				**16.67**

1 Land use category does not include area of parcels associated with point sources identified in Table 1.

7.1 Unit Flow Factors

The proposed unit flow factors for WWTP expansion analysis are presented in Table 7. Unit flow factors for single family residential are applied on a per dwelling unit (du) basis while unit flow factors for other land uses are on an acreage basis.

As explained previously, the temporary flow monitoring data identified wide variations in the unit flow factors for various land use types and was not representative of the entire service area. Water billing data from the City of Roseville and the permanent flow monitoring data from Roseville, SPMUD and Placer County presented a much broader picture which ultimately proved to be more representative of the entire service area.

Table 7 - Proposed Dry Weather Flow (DWF) Factors

Land Use Designation	Units	Proposed Unit Flow Factors WWTP Analysis[1]	1996 Master Plan Unit Flow Factor
Commercial	gpd per acre	850	1,040
Heavy Industrial	gpd per acre	850	1,560
Light Industrial	gpd per acre	850	1,040
Mixed Use	gpd per acre	2,300	N/A
Public/Quasi-Public	gpd per acre	660	1,040
Schools	gpd per acre	170	N/A
Residential 1 DU	gpd per du	190	260
Residential 2 DU	gpd per du	190	260
Residential 3 DU	gpd per du	190	260
Residential Mult. DU[2]	gpd per acre	2,040	4,160
Open Space	gpd per acre	0	0
Parks > 10 Acres	gpd per acre	10	N/A
Vacant	gpd per acre	0	0

[1] Includes allowance for dry season GWI.

[2] The proposed Residential Multiple DU unit flow factor can also be represented as 130 gpd per du

8 DWF Unit Flow Factors and Future (Buildout) Flow Projections

Future DWF projections within the proposed 2005 Regional Service Area are based on the unit DWF factors developed for the WWTP analysis above (includes dry season GWI). These flow projections do not include the results of proposed redevelopment/intensification within Roseville and Rocklin which will be analyzed as a separate scenario and presented in the Land Use Redevelopment/Intensification TM (No 9a). Buildout dry weather flow projections within the proposed 2005 Regional Service Area are presented in Table 8.

Table 8 - Buildout Dry Weather Flow Projections Within Proposed 2005 Regional Service Area

		PG WWTP[3]		DC WWTP[4]		2005 Service Area	
Land Use	Unit Flow Factor	Buildout Units (ac or du)	Buildout DWF (mgd)	Buildout Units (ac or du)	Buildout DWF (mgd)	Buildout Units (ac or du)	Buildout DWF (mgd)
Commercial	850 gpd/ac	1,728	1.47	2,890	2.46	4,618	3.93
Heavy Industrial[1]	850 gpd/ac	1,680	1.43	263	0.22	1,943	1.65
Light Industrial[1]	850 gpd/ac	1,221	1.04	637	0.54	1,858	1.58
Mixed Use	2,300 gpd/ac	0	0.00	7	0.02	7	0.02
Public/Quasi-Public[1]	660 gpd/ac	282	0.19	851	0.56	1,133	0.75
Schools	170 gpd/ac	258	0.04	540	0.09	798	0.14
Residential 1 DU	190 gpd/du	26,893	5.11	42,934	8.16	69,827	13.27
Residential 2 DU	190 gpd/du	2	0.0004	2,122	0.40	2,124	0.40
Residential 3 DU	190 gpd/du	12	0.002	720	0.14	732	0.14
Residential Multiple DU	2,040 gpd/ac	594	1.21	606	1.24	1,200	2.45
Open Space	0 gpd/ac	6,034	0.00	3,304	0.00	9,338	0.00
Parks > 10 Acres	10 gpd/ac	270	0.003	360	0.004	630	0.01
Point Sources	Varies gpd/ac	1,043	2.56	91	0.14	1,134	2.70
Placer Ranch[2]	Varies gpd/ac	1,027	0.90	0	0.00	1,027	0.90
West Roseville[2]	Varies gpd/ac	3,162	1.70	0	0.00	3,162	1.70
Placer Vineyards[2]	Varies gpd/ac	0	0.00	1,079	0.85	1,079	0.85
Total (mgd)			**15.7**		**14.8**		**30.5**

[1] Land use category does not include area of parcels associated with point sources identified in Table 1.
[2] Includes portion of development located within the Proposed 2005 Regional Service Area.
[3] Pleasant Grove WWTP Service Area
[4] Dry Creek WWTP Service Area

9 1996 Service Area DWF Projection Comparison

A review of the flow projections for the 1996 Master Plan EIR Service Area boundary was completed. This review compares 1996 and 2005 flow projections within the 1996 Service Area boundary. The flow projection for the 1996 Service Area as calculated in the 1996 Master Plan is 45.6 mgd. This 1996 flow projection utilized the 1996 Master Plan unit flow factors (shown in Table 7) to project flows in the service area and different land use assumptions. Since 1996, land use within the service area has changed and the unit flow factors established in this Master Plan have caused the 2005 flow projection within the 1996 Service Area to decrease to 29.0 mgd (shown in Table 9). This decrease can be attributed to reductions in the residential unit flow factor and an approximately 20 percent reduction in the development densities. Note that the 29.0 mgd flow projection is less than the 30.5 mgd presented in Table 8 for the Proposed 2005 Regional Service Area. The Proposed 2005 Regional Service Area is inclusive of the 1996 Master Plan EIR Service Area, and also includes the "housekeeping areas" (West Roseville, Clover Valley Lakes, and others) documented in TM No. 1a.

Table 9 – Dry Weather Flow for the 1996 Service Area with new Unit Flow Factors

		PG WWTP[3]		DC WWTP[4]		2005 Service Area	
Land Use	Unit Flow Factor	Buildout Units (ac or du)	Buildout DWF (mgd)	Buildout Units (ac or du)	Buildout DWF (mgd)	Buildout Units (ac or du)	Buildout DWF (mgd)
Commercial	850 gpd/ac	1,728	1.47	2,864	2.43	4,592	3.90
Heavy Industrial[1]	850 gpd/ac	1,680	1.43	263	0.22	1,943	1.65
Light Industrial[1]	850 gpd/ac	1,221	1.04	637	0.51	1,858	1.58
Mixed Use	2,300 gpd/ac	0	0.00	7	0.02	7	0.02
Public/Quasi-Public[1]	660 gpd/ac	282	0.19	829	0.55	1,111	0.73
Schools	170 gpd/ac	258	0.04	394	0.07	652	0.11
Residential 1 DU	190 gpd/du	26,671	5.07	40,956	7.78	67,627	12.85
Residential 2 DU	190 gpd/du	2	0.0004	2,122	0.40	2,124	0.40
Residential 3 DU	190 gpd/du	12	0.002	720	0.14	732	0.14
Residential Multiple DU	2,040 gpd/ac	594	1.21	606	1.24	1,200	2.45
Open Space	0 gpd/ac	4,004	0.00	3,290	0.00	7,294	0.00
Parks > 10 Acres	10 gpd/ac	270	0.003	360	0.004	630	0.01
Point Sources	Varies gpd/ac	1,043	2.56	91	0.14	1,134	2.70
Placer Ranch[2]	Varies gpd/ac	1,027	0.90	0	0.00	1,027	0.90
West Roseville[2]	Varies gpd/ac	1,316	0.67	0	0.00	1,316	0.67
Placer Vineyards[2]	Varies gpd/ac	0	0.00	1,079	0.85	1,079	0.85
Total (mgd)			**14.6**		**14.4**		**29.0**

[1] Land use category does not include area of parcels associated with point sources identified in Table 1.
[2] Includes portion of development located within the Proposed 2005 Regional Service Area.
[3] Pleasant Grove WWTP Service Area
[4] Dry Creek WWTP Service Area

Technical Memorandum

SOUTH PLACER WASTEWATER AUTHORITY (SPWA) WASTEWATER AND RECYCLED WATER SYSTEMS EVALUATION PROJECT

Subject:	**Current and Buildout Land Use – (TM No. 1b)**
Prepared For:	Art O'Brien – City of Roseville
Prepared by:	Pete Bellows/Chris Peters – Brown and Caldwell
Reviewed by:	Dave Richardson/Gisa Ju - RMC
Date:	November 2, 2005
Reference:	0091-004 Task 1

1 Introduction

This technical memorandum (TM) documents and provides a summary of the current (June 2004) and buildout land use estimates for the South Placer Wastewater Authority (SPWA) Wastewater and Recycled Water Systems Evaluation Project (Systems Evaluation Project). The identification of the service area boundary, development of the land use database, and evaluation of existing and future land use scenarios are critical tasks in order to understand existing and future wastewater production to properly plan for and design collection, conveyance, and treatment systems and facilities. The land use database developed for the 2005 Systems Evaluation Project and summarized in this TM will be used to:

- Project existing and future wastewater flows for the SPWA service area;
- Identify existing deficiencies in the regional collection system and plan for future expansion;
- Determine routing options for conveying wastewater flow from future urban growth areas (UGAs) to SPWA Regional Treatment Plants; and
- Plan for future expansion of wastewater treatment facilities.

The planned rezoning and intensification scenario in Roseville and Rocklin will be handled as a separate scenario for land use planning and are not included in this TM.

This TM is organized as follows:

1. Introduction
2. Land Use Information Sources
3. 1996 and 2005 Service Area Boundaries
4. Land Use within the 2005 Proposed Service Area Boundary
5. Buildout Land Use within Urban Growth Areas
6. Land Use Database Documentation

2 Land Use Information Sources

The land use database for areas within the 2005 proposed service area boundary was developed by Environmental Science Associates, Inc. (ESA) based on the information sources presented below. In addition to these documented land use sources, ongoing discussions occurred with planners and developers for each of the Urban Growth Areas (UGAs) presented later in this TM. Final documentation and changes made to the land use database developed by ESA are discussed in Section 6 at the conclusion of this TM.

Current General Plans

- City of Roseville (February 2004)
- City of Rocklin (April 1991)
- Town of Loomis (July 2001)
- Placer County (August 1994)
- Granite Bay Community Plan (May 1989)

Geographic Information System (GIS) Data in ESRI Shapefile Format

- City of Roseville GIS data (Roseville Land Inventory (RLI))
- Placer County GIS and County Assessor data
- 1996 Service Area Boundary, digitized by ESA.
- 2005 (Proposed) Service Area Boundary, digitized by ESA.

Specific Plans

- Placer Vineyards (September 2004)
- Placer Ranch (December 2004)
- West Roseville (August 2003)
- Regional University (March 2005)

3 1996 and 2005 Service Area Boundaries

The 1996 Wastewater Master Plan (1996 Master Plan) Environmental Impact Report (EIR) Service Area (Regional Service Area) boundary was established with the adoption of the 1996 Master Plan and associated EIR. The 2005 Systems Evaluation Project proposed service area boundary is an update of the 1996 Master Plan EIR Service Area boundary. The update includes ten areas outside of the 1996 Master Plan EIR Service Area (also known as "House-Keeping Areas") that have been annexed by the SPWA partner agencies since 1996. Further discussion of these two service area boundaries and how they impact this evaluation is presented below.

3.1 1996 Master Plan Service Area Boundary

This 1996 Master Plan EIR Regional Service Area, shown in Figure 1 at the end of this TM, will be used in the Systems Evaluation Project along with updated buildout land use projections and unit flow factors (developed as part of the Systems Evaluation Project) to generate revised buildout flow projections for the SPWA regional treatment facilities for comparative purposes. The revised buildout flow projections inside the 1996 Regional Service Area will be compared with the 1996 projected buildout flows to provide an update for the connection fee analysis to be performed by the SPWA financial advisor.

3.2 2005 Proposed Service Area Boundary

The Systems Evaluation Project proposed service area boundary is shown in Figure 2 at the end of this TM and was presented to the SPWA board in January 2005. To date, this boundary has not been formally approved by the SPWA board. Further discussion on the development of the Systems Evaluation Project

proposed service area boundary is documented in the Proposed 2005 Regional Service Area Boundary TM No. 1a dated January 13, 2005.

4 Land Use within the 2005 Service Area

Land use information provides the basis for developing unit wastewater flows and wastewater flow projections. Understanding the nature and distribution of urban development is important for proper planning and staging of sewer collection infrastructure and treatment facilities. Additionally, identification of parcels that are currently "connected" to the collection system is required to balance wastewater unit flow factors and calibrate the sewer model for the existing system. The key result from the land use analysis was the development of the land use map and associated database. The land use map and database are each parcel-based.

Land use map development was a multi-step process that included consolidating the current land use codes into a manageable system; identifying parcels connected to the wastewater collection system for current and buildout conditions; plotting current and buildout land use maps for review by the SPWA member agencies; and checking the land use data against current general plans for Roseville, Rocklin, Loomis, Granite Bay and Placer County. A review of land use maps developed from the project team's database identified some minor discrepancies with the current published General Plans. These discrepancies were corrected to match the current General Plan status and are documented in Section 6 at the end of this TM.

4.1 Land Use Code Consolidation

The land use database developed by the project team (version no. 1) included approximately 114 land use codes previously used by the City of Roseville and Placer County. The project team consolidated these 114 codes into 17 general land use codes (version no. 2). The project team then further consolidated the 17 codes into 12 land use codes to simplify the process of projecting current and future wastewater flows in the hydraulic model (version no. 3). The version no. 3 consolidation process lumped all of the non-flow producing land use types into one "Open Space" category and introduced three new land use codes (Mixed Use, Schools and Parks > 10 Acres). The land use code consolidation is presented in Table 1.

Table 1: Consolidated Land Use Codes

Final (Version No. 3) Land Use Code	Version No. 2 Land Use Code	Roseville/Placer County Land Use Code (Version No. 1)
Commercial	Commercial	Auto Sales, Repair Automotive Banks, S&L's, Credit Union Commercial Commercial Recreation Commercial Store Condominium Office Fast Food Restaurant Financial Building Hotel Hotel, Motels, Resorts Mini-Market with Gas Mini-Market, no Gas Miscellaneous Commercial Office Building Office General Office Medical/Dental Residential and Hotel Restaurant Restaurants, Cocktail Lounges Retail Service Station Shopping Center Small Food Suburban Store Theater, Bowling Alley
Heavy Industrial	Heavy Industrial	Food Processing Heavy Industrial Miscellaneous Industrial
Light Industrial	Light Industrial Storage	Business Industrial Park Condominium Industrial Industrial Condominium Light Industrial Light Manufacturing Mini-Storage, Covered Storage Self Storage Uncovered Storage, Wrecking Yard Warehouse
Mixed Use	n/a	Residential and Office Residential and Retail

Final (Version No. 3) Land Use Code	Version No. 2 Land Use Code	Roseville/Placer County Land Use Code (Version No. 1)
Open Space	Agriculture Open Space Parks (Area < 10 Acres) Mining Right of Way	CLCA Restriction, Non-Renewal CLCA Restriction, Under Contract Irrigated Farm Orchards, Vineyards Poultry & Small Animals Rice Crop Vacant, Dry Farm Mineral Rights Mining Claims Mining Quarry Backyard Area Cemetery Cemeteries Creek Area Fairgrounds Golf Course Greenbelt Landscape Easement Open Space Rivers, Lakes, Reservoir, Canal Wetlands, Vernal Pools Camps & Parks, General Non-Profit Camps/Parks Park (Area < 10 Acres) Tennis/Swimming Clubs Highways, Roads, Streets Pipeline R/W Right of Way Utility Easement Parking Lot Parking Lots
Parks > 10 Acres	Parks (Area > 10 Acres)	Park (Area > 10 Acres)

Final (Version No. 3) Land Use Code	Version No. 2 Land Use Code	Roseville/Placer County Land Use Code (Version No. 1)
Public/Quasi Public	Public/Quasi-Public	Church Churches Club Convalescent Hospital Day Care Centers Hospital Hospitals Convalescent Lodges, Halls Misc. Public Buildings Miscellaneous Institutional Preschool Public Building Utilities, Public & Private Utility
Residential 1 DU	Residential 1 DU Residential Large Lot Mobile Home (Individual)	Condominium Residence on Commercial Land Single Fam Res, Condominium Single Fam Res, Half Plex Single Family Residence Timeshares Mobile Home Outside of Park
Residential 2 DU	Residential 2 DU	2 Single Fam Res, Duplex Duplex
Residential 3 DU	Residential 3 DU	3 Single Fam Res, Triplex Triplex
Residential Multiple DU	Residential Multiple DU Mobile Home (Park)	Apartment Apartments, 4 Units or More Mobile Home in M H Park Mobile Home Park
Schools	n/a	School Schools
Vacant [1]	Vacant	Business Potential Commercial Potential Common Area Industrial Potential Institutional Potential Residential Potential Residential, Auxiliary Imp Vacant Vacant Industrial Vacant, Commercial Vacant, Subdivided Residential

[1] The vacant land use code is only used for the current land use scenario. For the buildout land use scenario, vacant parcels are assigned the land use category as specified in their respective General Plan.

4.2 Current Land Use within the 2005 Service Area

Currently developed parcels were identified in the original (version no. 1) land use database based on their current land use code. The original land use database identified parcels that are not currently developed as "vacant". However, not all of the developed parcels within the proposed 2005 service contribute flow to the wastewater collection system. These developed parcels that do not contribute flow most likely have onsite septic wastewater treatment systems. To project current wastewater flow and calibrate the sewer model for the existing system, parcels that are currently connected to the SPWA collection system were identified. The process used to identify connected parcels is documented in the January 26, 2005 TM No 1c entitled "Identification of Parcels Connected or Not Connected to Sewers in the SPWA Project Area".

Generally, parcels within the City of Roseville were identified as connected based on their development status and the understanding that there are no septic tanks within the City of Roseville. Parcels within SPMUD were identified as connected based on their development status and whether or not they were located in an area designated as septic tank service by SPMUD. Parcels within Placer County were identified as connected if they currently receive a sewer bill from the County. Placer County provided sewer billing information that was linked to the parcel database provided by ESA. Parcels that linked to a sewer bill were designated as connected.

A summary of the current connected land use within the 2005 Service Area is presented in Table 2. The current connected land use map is shown in Figure 3 at the end of this TM. There are 22,159 current connected acres within the proposed 2005 Regional Service Area. Approximately 67 percent of the current connected land is classified as single or multi-family residential. Approximately 10 percent of the current connected land is currently classified as open space. Approximately 29,844 acres within the 2005 Service Area is vacant or not connected.

4.3 Buildout Land Use within the 2005 Service Area

Buildout land use in the 2005 Service Area was identified in the original land use database according to General Plan data from the City of Roseville and Placer County. The buildout land use scenario includes all currently developed parcels (currently developed parcels that are not connected are assumed to be connected to the collection system); new developments in vacant areas; and the residential redevelopment of currently developed parcels greater that ½ acre that have not been subdivided where the General Plan or Specific Plan allows denser development. This ½ acre residential redevelopment should not be confused with the redevelopment/intensification scenarios in Roseville and Rocklin that will be presented in the Land Use Intensification TM 9c. Future residential redevelopment in Roseville was calculated based development densities allowed by specific plans. In areas outside of Roseville, future residential development was calculated based on the historical average development densities for the specific residential land use types. These redevelopment densities are documented in the land use database that will be provided at the end of this project. For the buildout condition, all parcels are considered to be connected to the wastewater collection system even though some land uses in the "Open Space" category do not generate wastewater.

A summary of the buildout land use within the proposed 2005 Regional Service Area is provided in Table 3. The buildout land use map is shown in Figure 4 at the end of this TM.

The buildout 2005 Regional Service Area includes portions of two Urban Growth Areas (UGAs), the remainder of which are outside both the 1996 Service Area and the 2005 Regional Service Area. Further explanation of the UGAs is provided in the next section of this TM. The 2005 Regional Service Area also includes "House-Keeping Areas", discussed in TM No. 1a. The largest of those "House-Keeping areas" is

the West Roseville Specific Plan. The UGAs and West Roseville are currently comprised of several large parcels that have not been subdivided to reflect the proposed future developments.

Table 2: Current Land Use Summary within the Proposed 2005 Regional Service Area

Land Use Designation	Current Connected Area (Acres)		Total Current Connected Area (Acres)
	Pleasant Grove Watershed	Dry Creek Watershed	
Commercial	495	1,622	2,117
Heavy Industrial	364	111	475
Light Industrial	616	316	932
Mixed Use	0	7	7
Open Space	1,398	737	2,135
Parks > 10 Acres	247	263	510
Public/Quasi-Public	154	467	621
Residential 1 DU	4,186	9,343	13,529
Residential 2 DU	0	280	280
Residential 3 DU	0	37	37
Residential Multiple DU	380	547	927
Schools	171	418	589
Total Acreage	**8,011**	**14,148**	**22,159**

Table 3 – Buildout Land Use Summary within the Proposed 2005 Regional Service Area

Land Use Designation	Buildout Connected Area (Acres)		Total Future Connected Area (Acres[1,2])
	Pleasant Grove Watershed[1]	Dry Creek Watershed[2]	
Commercial	2,111	2,915	5,026
Heavy Industrial	1,714	263	1,977
Light Industrial	1,598	637	2,235
Mixed Use	27	30	57
Open Space	7,320	3,546	10,866
Parks > 10 Acres	270	360	630
Public/Quasi-Public	323	877	1,200
Residential 1 DU	7,700	18,798	26,498
Residential 2 DU	0	839	839
Residential 3 DU	9	366	375
Residential Multiple DU	727	647	1,374
Schools	376	550	926
Total Acreage	**22,175**	**29,828**	**52,003**

1 Includes portion of Placer Ranch UGA within the proposed 2005 service area.

2 Includes portion of Placer Vineyard UGA within the proposed 2005 service area.

5 Urban Growth Areas

The buildout service area boundary to be used in the Systems Evaluation Project expands upon the 2005 systems evaluation service area boundary to include ten Urban Growth Areas (UGAs) identified at the time of this evaluation. These UGA summaries are provided in Tables 4 and 5. The UGAs are shown with the buildout land use map in Figure 4.

UGAs are defined as potential future planning areas that are projected to generate wastewater flow requiring sewerage and meet one or more of the following criteria:

- The area has been annexed, or is being considered for annexation, into a jurisdiction served by SPWA member agencies (Placer County, City of Roseville, or SPMUD).
- The area is part of, or defined as, a Specific Plan Area by the land use planning agency serving one of SPWA members (Placer County, City of Roseville, and City of Rocklin (served by SPMUD), Town of Loomis (served by SPMUD).
- One of the member agencies has provided documented direction to staff in a public forum to analyze the effects of providing sewer service to the planning area for regional wastewater and recycled water systems.

Two of these proposed development areas, Placer Ranch and Placer Vineyard, include areas that are located within the 1996 Master Plan EIR Regional Service Area Boundary (same as the proposed 2005 Service Area Boundary for these UGAs). For the Systems Evaluation Project, only the portions that are outside of the 1996 Master Plan EIR Regional Service Area boundary are considered as a UGA.

The planning areas and properties not being considered as UGAs at this time include Brookfield, AKT North, Amoruso Way, Reason Farms, and the Landfill Areas. Brookfield and AKT North have not been

included due to the lack of planning information for these areas at this time and they do not meet the criteria above. Reason Farms is a detention basin and is not expected to generate any wastewater. Amoruso Way has not been included because it is expected that flow projections for future sewerage will be addressed in the Placer Ranch specific plan. The "Landfill Outside" and "Future Landfill Expansion" planning areas not expected to generate wastewater requiring sewerage.

Table 4: Urban Growth Areas

Urban Growth Area (UGA)	Land Use Source	Total Acres
Curry Creek UGA	Placer County [(b)]	3,212
Regional University UGA	MacKay & Somps Civil Engineers Inc.	1,140
Inviro Tech UGA [(c)]	Placer County	5
Placer UGA[(d)]	Placer County	630
Orchard Creek [(e)]	Placer County	25
Placer Ranch [(f)]	Terrance E. Lowell & Associates, Inc.	807
Placer Vineyards [(g)]	MacKay & Somps Civil Engineers Inc.	1,062
SMD-3	Placer County	2,231
SPMUD UGA	City of Rocklin & Town of Loomis [(h)]	2,319
Creekview UGA	MacKay & Somps Civil Engineers Inc.	575
Sierra Vista UGA	MacKay & Somps Civil Engineers Inc.	1,785
TOTAL		**13,791**[a]

[(a)] Total acres outside of the 1996 Master Plan EIR Regional Service Area boundary
[(b)] Preliminary land use estimates for Curry Creek was developed by RMC and approved by Placer County based on land use ratios developed by the West Roseville Specific Plan.
[(c)] This parcel is currently served by the County.
[(d)] This square "island" area is not expected to be sewered at buildout due to topography and low development density.
[(e)] Placer County plans to sewer this area north of Athens Road via the SPWA collection system due to the natural topography of the area.
[(f)] The Placer Ranch project comprised of a total of 2,213 acres with 1,027 acres located inside the 1996 Master Plan EIR Regional Service Area boundary, 807 acres located outside of this boundary and 379 acres designated as ROW. The 807 acres located outside of the 1996 Master Plan EIR Regional Service Area boundary will be considered as a UGA as part of the Systems Evaluation Project.
[(g)] The Placer Vineyards project comprised of a total of approximately 5,148 acres with approximately 1,062 acres located inside the 1996 Master Plan EIR Regional Service Area boundary and 4,806 acres (including ROW) located outside of this boundary. The 4,806 acres located outside of the 1996 Master Plan EIR Regional Service Area boundary will be considered as a UGA as part of the Systems Evaluation Project.
[(h)] SPMUD UGA land use information developed by RMC based on General Plan information for the City of Rocklin and Town of Loomis.

Table 5: Urban Growth Land Use Summary

Urban Growth Area	Land Use Category	Area (acres)	Dwelling Units
Curry Creek UGA	Open Space	931	--
	Park > 10 Acres	289	--
	Commercial	161	--
	Heavy Industrial	64	--
	Light Industrial	161	--
	Mixed Use	64	385
	Public/Quasi-Public	161	--
	Schools	96	--
	Residential 1 DU	1,124	8,998
	Residential Multiple DU	161	3,210
	Sub-Total	**3,212**	**12,583**
Regional University UGA	Open Space	359	--
	Commercial	0	--
	Heavy Industrial	0	--
	Light Industrial	0	--
	Mixed Use	23	75
	Public/Quasi-Public	11	--
	Schools	10	--
	Residential 1 DU	327	2,556
	Residential Multiple DU	46	931
	University (Point Source)	364	825
	Sub-Total	**1,140**	**4,387**
Inviro Tech UGA	Open Space	--	--
	Commercial	--	--
	Heavy Industrial	--	--
	Light Industrial	5	--
	Mixed Use	--	--
	Public/Quasi-Public	--	--
	Schools	--	--
	Residential 1 DU	--	--
	Residential Multiple DU	--	--
	Sub-Total	**5**	**0**
Placer UGA	Open Space	--	--
	Commercial	--	--
	Heavy Industrial	--	--
	Light Industrial	--	--
	Mixed Use	--	--
	Public/Quasi-Public	--	--
	Schools	--	--
	Residential 1 DU	630	27
	Residential Multiple DU	--	--
	Sub-Total	**630**	**27**

Urban Growth Area	Land Use Category	Area (acres)	Dwelling Units
Orchard Creek UGA	Open Space	--	--
	Commercial	--	--
	Heavy Industrial	--	--
	Light Industrial	25	--
	Mixed Use	--	--
	Public/Quasi-Public	--	--
	Schools	--	--
	Residential 1 DU	--	--
	Residential Multiple DU	--	--
	Sub-Total	**25**	**0**
Placer Ranch (Outside 2005 Service Area)	Open Space	148	--
	Commercial	79	--
	Heavy Industrial	0	--
	Light Industrial	32	--
	Mixed Use	21	250
	Public/Quasi-Public	0	--
	Schools	30	--
	Residential 1 DU	251	2,038
	Residential Multiple DU	78	2,453
	University (Point Source)	168	--
	Sub-Total	**807**	**4,741**
Placer Vineyard (Outside 2005 Service Area)	Open Space	729	--
	Commercial	225	--
	Heavy Industrial	0	--
	Light Industrial	0	--
	Mixed Use	87	NA
	Public/Quasi-Public	137	--
	Schools	204	--
	Residential 1 DU	NA	9,843
	Residential Multiple DU	NA	5,013
	Sub-Total	**NA**	**NA**
SMD-3	Open Space	0	--
	Commercial	3	--
	Heavy Industrial	0	--
	Light Industrial	0	--
	Mixed Use	0	--
	Public/Quasi-Public	11	--
	Schools	0	--
	Residential 1 DU	2,169	1,268
	Residential 2 DU	23	14
	Residential Multiple DU	25	250
	Sub-Total	**2,231**	**1,532**

Urban Growth Area	Land Use Category	Area (acres)	Dwelling Units
SPMUD UGA	Open Space	97	--
	Commercial	99	--
	Heavy Industrial	0	--
	Light Industrial	0	--
	Mixed Use	0	--
	Public/Quasi-Public	0	--
	Schools	0	--
	Residential 1 DU	2,123	5,300
	Residential Multiple DU	0	0
	Sub-Total	**2,319**	**5,300**
Creekview	Open Space	219	--
	Commercial	29	--
	Heavy Industrial	11	--
	Light Industrial	19	--
	Mixed Use	11	NA
	Public/Quasi-Public	19	--
	Schools	17	--
	Residential 1 DU	NA	1,610
	Residential Multiple DU	NA	575
	Sub-Total	**NA**	**NA**
Sierra Vista	Open Space	412	--
	Commercial	125	--
	Heavy Industrial	0	--
	Light Industrial	0	--
	Mixed Use	56	562
	Public/Quasi-Public	28	--
	Schools	60	--
	Residential 1 DU	944	7,167
	Residential Multiple DU	160	3,200
	Sub-Total	**1,785**	**10,929**

6 Land Use Database Documentation

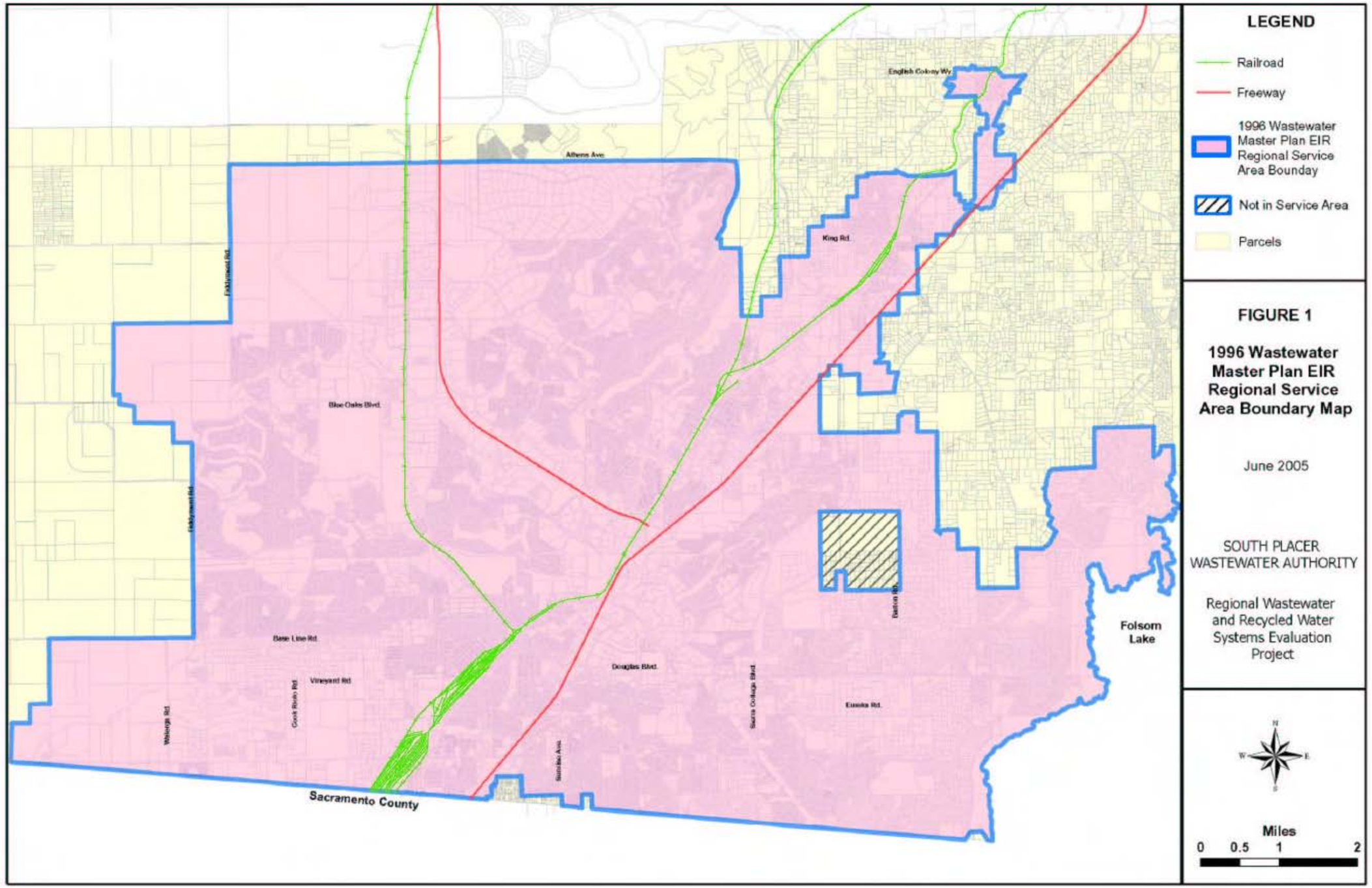
The final land use database developed by the project team will be provided to SPWA at the conclusion of this project. A definition table for each field name in the database is provided in Table 7. This table also identifies source of data used in each field. During the development of the database, visual map checks were performed comparing maps generated from the database to maps provided in the individual General Plans. During this process, a number of corrections were made to the land use database assuming that the General Plan was the final data source. A summary of each change that was made to the database is provided in Table 8.

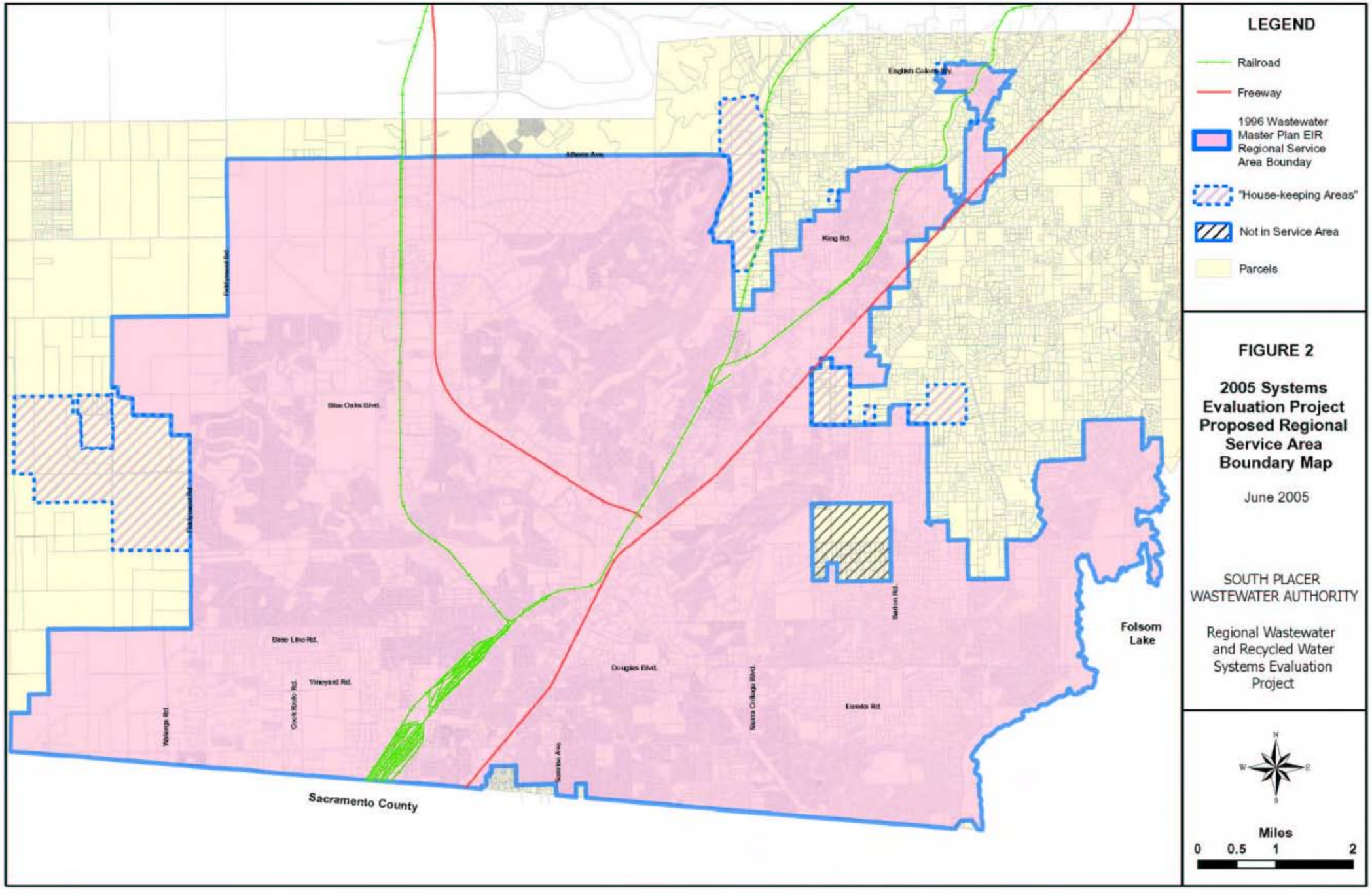
Table 7: Land Use Database Field Definition

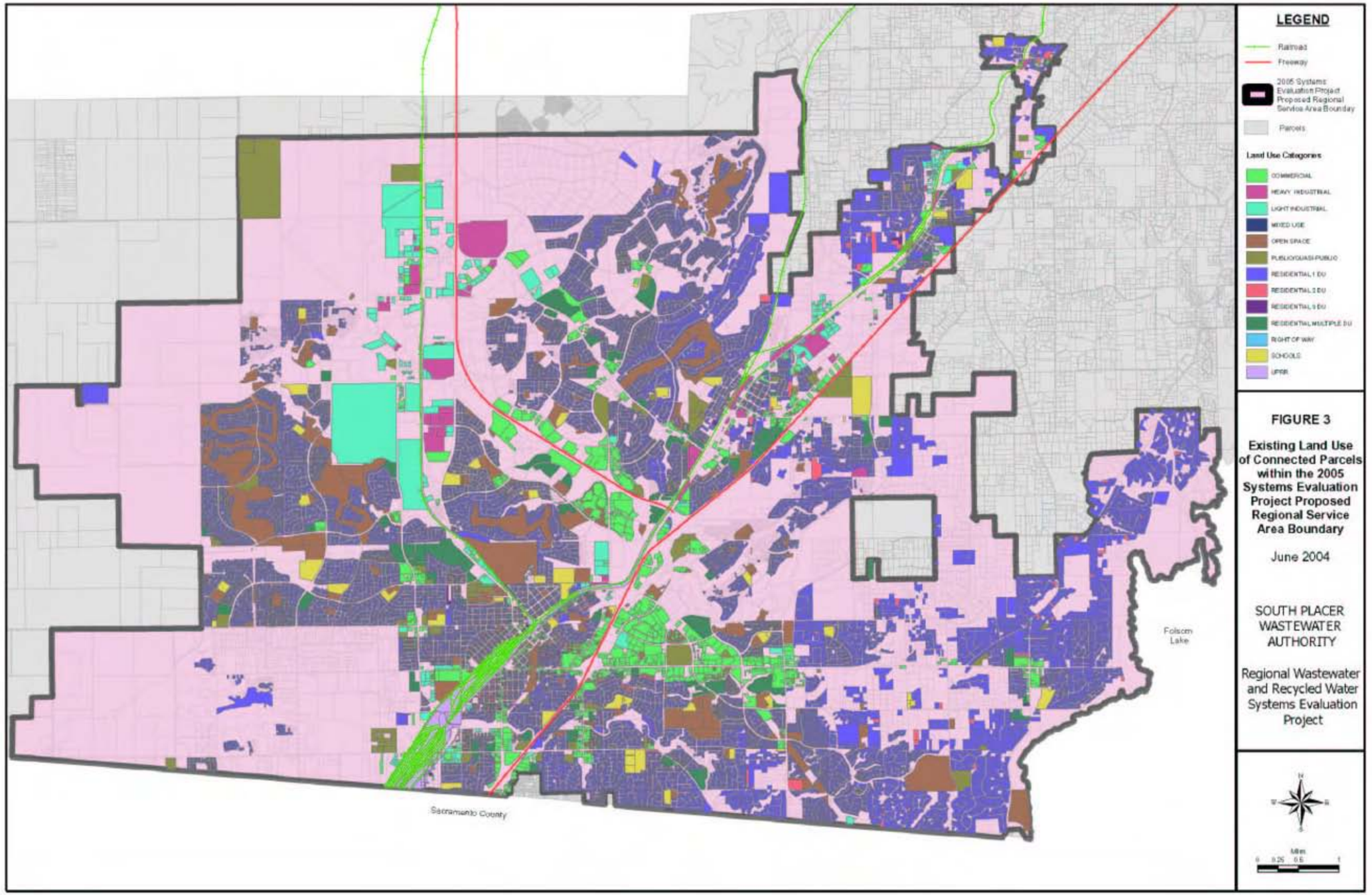
Field Name	Field Definition	Data Source
FID	INTERNAL FEATURE NUMBER	ESRI
SHAPE	FEATURE GEOMETRY	ESRI
APN	ASSESSORS PARCEL NUMBER	PLACER COUNTY, ROSEVILLE
ACRES	PARCEL ACREAGE	ESA
ELUC	EXISTING LAND USE CLASSIFICATION	PLACER COUNTY, ROSEVILLE
ELUC_DESC	EXISTING LAND USE CLASSIFICATION DESCRIPTION	PLACER COUNTY, ROSEVILLE
SOURCE	SOURCE OF EXISTING LAND USE DATA	ESA
GPCLASS	FUTURE LAND USE CLASSIFICATION PER GENERAL PLAN	PLACER COUNTY, ROSEVILLE, ROCKLIN
BC_CURRENT	CURRENT LAND USE USING CONSOLIDATED LAND USE CODES	BC
BC_FUTURE	BUILDOUT LAND USE USING CONSOLIDATED LAND USE CODES	BC
MANHOLE_ID	MANHOLE WHERE FLOW IS LOADED IN THE SPWA REGIONAL TRUNK SEWER MODEL (MAY BE DIFFERENT THAN THE ROSEVILLE MODEL MANHOLE_ID)	BC
POINT_X	X-COORDINATE OF THE PARCEL CENTROID TO LOAD FLOW IN THE MODEL	BC
POINT_Y	Y-COORDINATE OF THE PARCEL CENTROID TO LOAD FLOW IN THE MODEL	BC
DU_DENSITY	RESIDENTIAL DEVELOPMENT DENSITY USED TO CALCULATE FUTURE DU ON PARCELS GREATER THAN ½ ACRE	ESA
BC_UNIT	CURRENT PARCEL ACRES OR DWELLING UNITS TO CALCULATE FLOW LOAD IN THE MODEL	BC
FUT_BCUNIT	BUILDOUT PARCEL ACRES OR DWELLING UNITS TO CALCULATE FLOW LOAD IN THE MODEL	BC
POINT_SOURCE	IDENTIFICATION OF PARCELS THAT ARE LOADED INTO THE MODEL AS POINT SOURCES	BC
WWTP	WWTP TO WHICH PARCEL IS TRIBUTARY	BC
COMMENTS	MISCELLANEOUS COMMENTS FOR SPECIFIC PARCEL	BC

Table 8: Land Use Database Changes

FID_1	APN	Land Use Database Change
202	032-070-066-000	OPEN SPACE TO LDR FROM ROCKLIN GENERAL PLAN
206	030-030-059-000	OPEN SPACE TO LDR FROM ROCKLIN GENERAL PLAN
1760	044-290-034-000	PQP TO LDR FROM LOOMIS GENERAL PLAN
2027	376-010-008-000	LDR TO PARKS FROM ROCKLIN GENERAL PLAN
4288	044-072-020-000	PQP TO LDR FROM LOOMIS GENERAL PLAN
6830	368-080-021-000	LDR TO PARKS FROM ROCKLIN GENERAL PLAN
7181	044-121-052-000	LI TO COMMERCIAL FROM LOOMIS GENERAL PLAN
7184	044-123-065-000	PARKS TO COMMERCIAL FROM LOOMIS GENERAL PLAN
8168	017-350-057-000	LDR TO PARKS FROM ROCKLIN GENERAL PLAN
15137	016-030-018-000	LDR TO PARKS FROM ROCKLIN GENERAL PLAN
15617	016-240-030-000	LDR TO PARKS FROM ROCKLIN GENERAL PLAN
32428	017-116-006-000	OPEN SPACE TO PARK PER ESA MAP
33530	479-170-006-000	OPEN SPACE TO PARKS PER ESA MAP
34470	017-116-019-000	OPEN SPACE TO PARKS PER ESA MAP
38422	017-370-020-000	COMMERCIAL TO OPEN SPACE PER MAP
40423	017-370-019-000	COMMERCIAL TO LDR6.8 PER ESA MAP
49981	017-116-014-000	OPEN SPACE TO PARKS PER ESA MAP
55999	482-130-008-000	OPEN SPACE TO PARKS PER ESA MAP
56502	017-162-033-000	LDR TO PARKS PER ESA MAP
56958	477-080-004-000	RESIDENTIAL TO OPEN SPACE PER ESA MAP
57003	477-100-016-000	OPEN SPACE TO PARKS PER ESA MAP
60443	468-010-033-000	COMMERCIAL TO PARKS PER ROSEVILLE GENERAL PLAN
60483	048-171-005-000	PQP TO OPEN SPACE PER ESA MAP
63887	NA	OPEN SPACE TO PARKS PER ESA MAP
64468	NA	LDR TO PARKS PER ESA MAP


LEGEND
Railroad
Freeway
1996 Wastewater Master Plan EIR Regional Service Area Bounday
Not in Service Area
Parcels
FIGURE 1
1996 Wastewater Master Plan EIR Regional Service Area Boundary Map
June 2005
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Systems Evaluation Project
Miles
0 0.5 1 2
English Colony Wy.
Athens Ave.
King Rd.
Folsom Lake
Blue Oaks Blvd.
Base Line Rd.
Vineyard Rd.
Douglas Blvd.
Eureka Rd.
Sacramento County


LEGEND
Railroad
Freeway
1996 Wastewater Master Plan EIR Regional Service Area Bounday
"House-keeping Areas"
Not in Service Area
Parcels
FIGURE 2
2005 Systems Evaluation Project Proposed Regional Service Area Boundary Map
June 2005
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Systems Evaluation Project
Miles
0 0.5 1 2
Folsom Lake
Sacramento County
Base Line Rd.
Douglas Blvd.
Eureka Rd.
Barton Rd.
Sierra College Blvd.
Sunrise Ave.
Wyeth Rd.
Cook Riolo Rd.
Vineyard Rd.
Blue Oaks Blvd.
King Rd.
Folsom Blvd.


LEGEND
Railroad
Freeway
2005 Systems Evaluation Project Proposed Regional Service Area Boundary
Parcels
Land Use Categories
COMMERCIAL
HEAVY INDUSTRIAL
LIGHT INDUSTRIAL
MIXED USE
OPEN SPACE
PUBLIC/QUASI-PUBLIC
RESIDENTIAL 1 DU
RESIDENTIAL 2 DU
RESIDENTIAL 5 DU
RESIDENTIAL MULTIPLE DU
RIGHT OF WAY
SCHOOLS
UPRR
FIGURE 3
Existing Land Use of Connected Parcels within the 2005 Systems Evaluation Project Proposed Regional Service Area Boundary
June 2004
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Systems Evaluation Project
Folsom Lake
Sacramento County
N
W
E
S
Miles
0
0.25
0.5
1

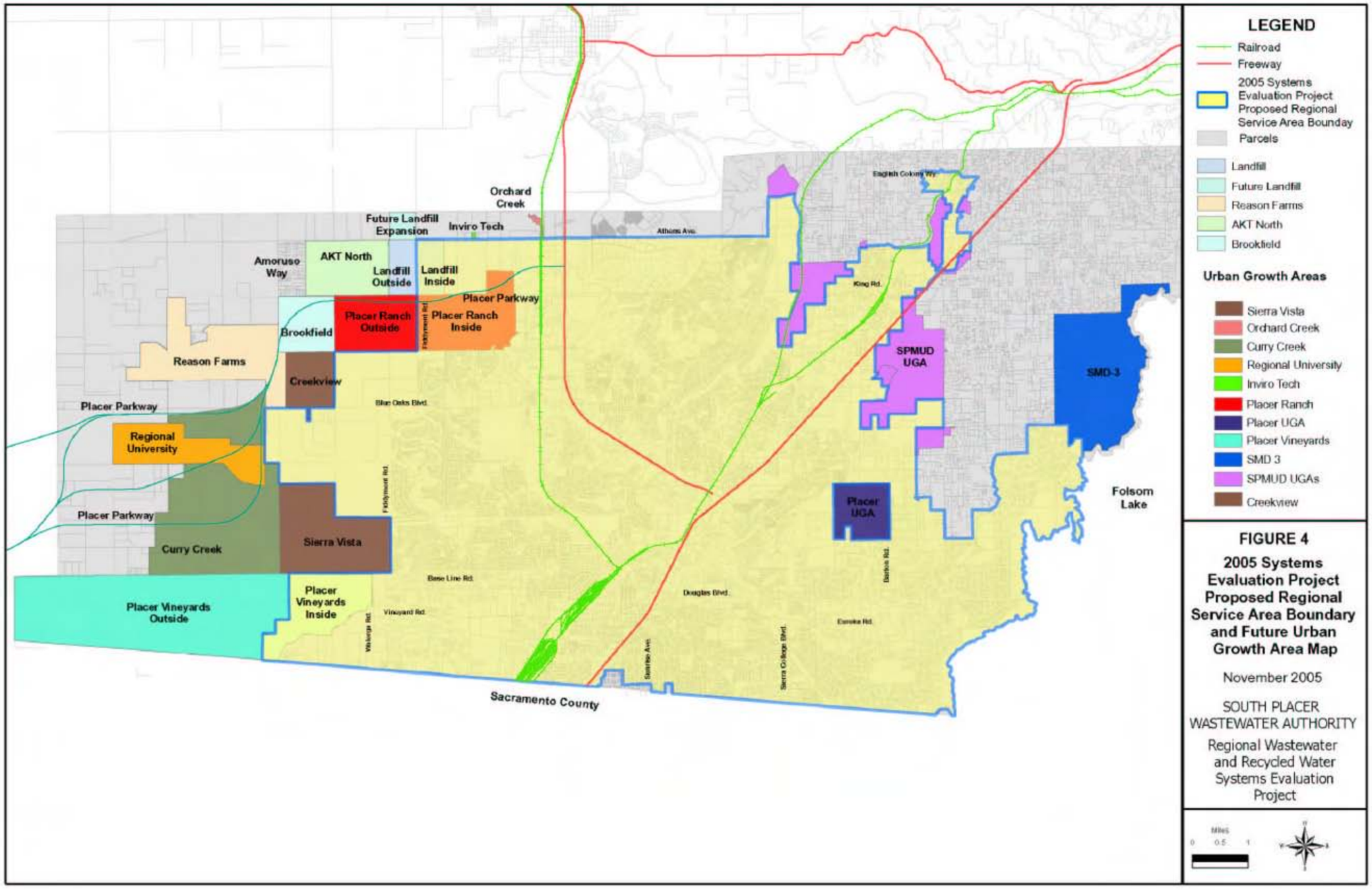


FIGURE 4
2005 Systems Evaluation Project Proposed Regional Service Area Boundary and Future Urban Growth Area Map

November 2005

SOUTH PLACER WASTEWATER AUTHORITY

Regional Wastewater and Recycled Water Systems Evaluation Project

Technical Memorandum

SOUTH PLACER WASTEWATER AUTHORITY (SPWA) WASTEWATER AND RECYCLED WATER SYSTEMS EVALUATION PROJECT

Subject: **Dry Weather Flow Projection for the Ultimate SPWA Service Area (Including Urban Growth Areas) -- (TM No. 2b)**

Prepared For: Art O'Brien – City of Roseville

Prepared by: Pete Bellows/Chris Peters – Brown and Caldwell

Reviewed by: Dave Richardson/Gisa Ju – RMC

Date: November 4, 2005

Reference: 0091-004 Task 2

1 Introduction

This technical memorandum (TM) summarizes the dry weather wastewater flow (DWF) projections for buildout conditions within the Ultimate SPWA service area. This includes flows generated within the proposed 2005 Service Area boundary and flows generated within the Urban Growth Areas (UGAs) located outside the proposed 2005 Service Area boundary. DWF projections are used to project flows for the analysis of the SPWA wastewater treatment plants.

This TM is a supplement to the Dry Weather Flow Projection for the Proposed 2005 Service Area TM (TM No. 2a) which summarized flow projections within the proposed 2005 Service Area. Further discussion of wastewater flow components, flow monitoring, development of the base sanitary flow (BSF) unit factors, and groundwater infiltration (GWI) is presented in TM No. 2a.

2 Future (Buildout) Land Use

Development of the buildout land use map (including UGAs), land use code designations, and connected land use is documented in the Land Use TM No. 1b. Future land use is based on buildout within the Ultimate Service Area as shown on the Land Use Map in Figure 1. For the buildout condition, all parcels are considered to be connected to the wastewater collection system even though some land uses in the "Open Space" category do not generate wastewater. Buildout land use acreages for connected parcels within the Ultimate Service Area are summarized in Table 1 and Table 2. Detailed land use summaries for each UGA are provided in Attachment A and Land Use TM No. 1b.

The total buildout acreage within the SPWA Ultimate Service Area is 65,794 acres. This includes 29,724 acres in the Pleasant Grove watershed and 36,070 acres in the Dry Creek watershed.

Table 1 – Buildout Land Use Summary within the Proposed 2005 Regional Service Area

Land Use Designation	Buildout Connected Area (Acres)		Total Future Connected Area (Acres[1,2])
	Pleasant Grove Watershed[1]	Dry Creek Watershed[2]	
Commercial	2,111	2,915	5,026
Heavy Industrial	1,714	263	1,977
Light Industrial	1,598	637	2,235
Mixed Use	27	30	57
Open Space	7,320	3,546	10,866
Parks > 10 Acres	270	360	630
Public/Quasi-Public	323	877	1,200
Residential 1 DU	7,700	18,798	26,498
Residential 2 DU	0	839	839
Residential 3 DU	9	366	375
Residential Multiple DU	727	647	1,374
Schools	376	550	926
Total Acreage	**22,175**	**29,828**	**52,003**

[1] Includes portion of Placer Ranch UGA within the proposed 2005 service area.
[2] Includes portion of Placer Vineyard UGA within the proposed 2005 service area.

Table 2 – Buildout Land Use Summary within the Urban Growth Areas

Urban Growth Area (UGA)	Buildout Connected Area (Acres)		Total Future Connected Area (Acres)
	Pleasant Grove Watershed	Dry Creek Watershed	
Curry Creek UGA	3,212	--	3,212
Regional University UGA	1,140	--	1,140
Inviro Tech UGA	5	--	5
Placer UGA	--	630	630
Orchard Creek	25	--	25
Placer Ranch [1]	807	--	807
Placer Vineyards [1]	--	1,062	1,062
SMD-3	--	2,231	2,231
SPMUD UGA	--	2,319	2,319
Creekview UGA	575		575
Sierra Vista UGA	1,785		1,785
Total Acreage	**7,549**	**6,242**	**13,791**

[1] Does not include portions of Placer Ranch or Placer Vineyards UGA within the proposed 2005 service area.

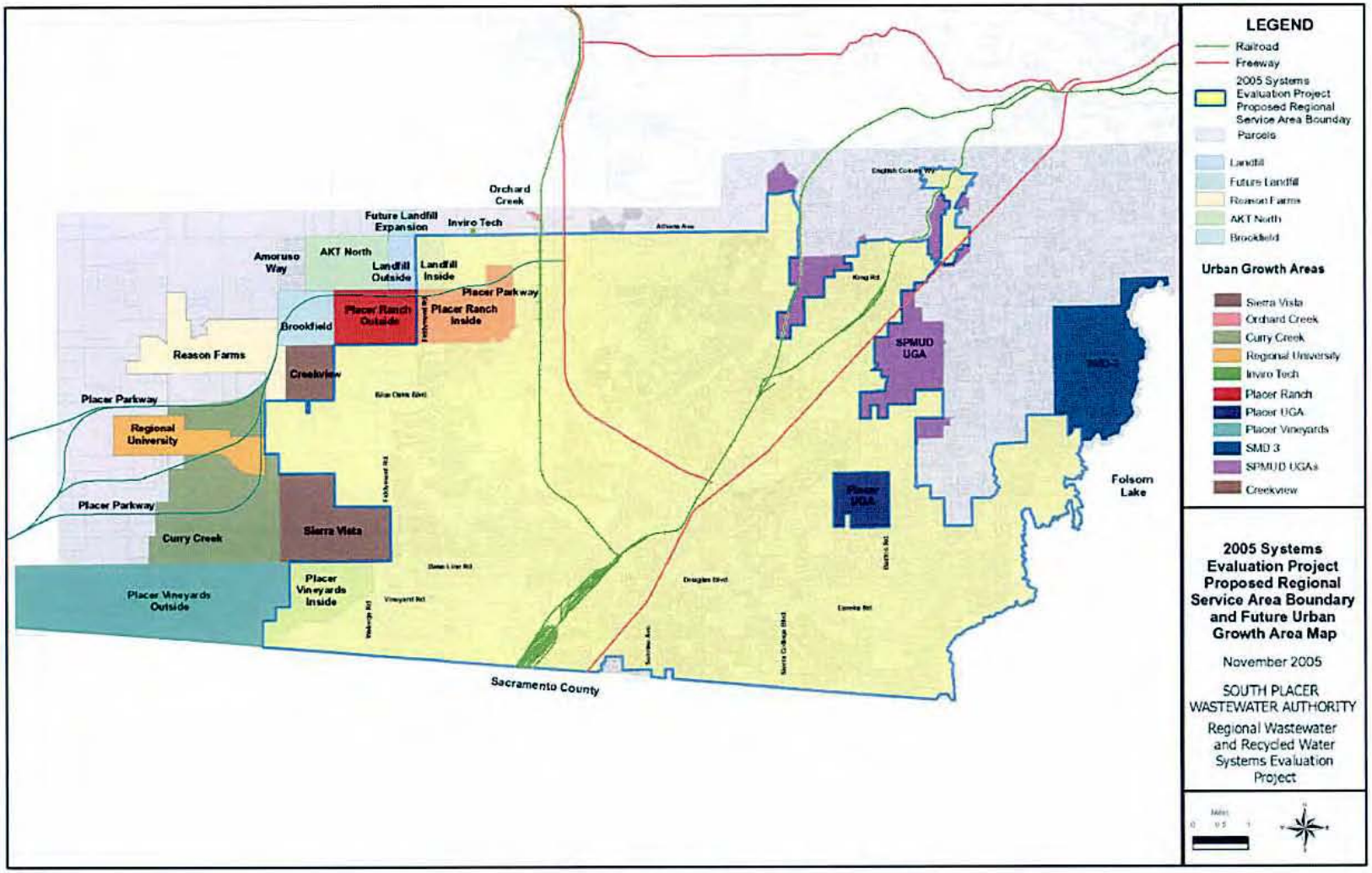


Figure 1 – Buildout Land Use Map Including UGAs

3 Point Sources

Seven existing point sources were identified within the proposed 2005 Service Area based on discussions with SPWA member agencies. Information about point sources is summarized in Table 1. There are also three point sources located within UGAs. These point source flows are included with the UGA flow projections presented later in this TM and the UGA flow projection worksheets provided in Attachment A. Existing point sources in the proposed 2005 Service Area were identified from flow monitoring and water billing information. The Placer County Landfill was also identified as a point source because it generates very little wastewater flow in comparison to its land area. Future flow projections from NEC and HP were provided by the City of Roseville and are based on buildout conditions for each development.

Table 1 - Current and Projected DWF from Point Sources in the Proposed 2005 Service Area

Point Source	Location	Current Flow Data Source	Current DWF (gpd)	Projected Buildout DWF (gpd)
Union Pacific Railroad	Roseville	City of Roseville	85,000	85,000
Landfill	Placer County	City of Roseville	5,000	5,000
NEC	Roseville	Flow Monitor Data	700,000	2,000,000
HP	Roseville	City of Roseville	150,000	484,000
Kaiser Hospital	Roseville	Water Use Data	50,000	50,000
Formica	Placer County	Placer County	60,000	60,000
Rio Bravo Power Plant	Placer County	Placer County	15,000	15,000

Notes: Flow projections are based upon existing land use and existing land use designations current as of June 2004, and will provide the estimated flows for baseline modeling scenario for SPWA. Rezoning of HP and Kaiser Hospital properties are now better known than in June 2004, and will be documented in TM No. 9b, and will be included in a "Land Use intensification Scenario".

4 Unit Flow Factors

Information about the development of unit flow factors used for the WWTP expansion analysis is discussed in the Dry Weather Flow Projection for the Proposed 2005 Service Area TM (TM No. 2a). The proposed unit flow factors for the buildout scenario are presented in Table 4. Unit flow factors for single family residential are applied on a per dwelling unit (du) basis while unit flow factors for other land uses are applied on an acreage basis.

Table 4 - Proposed Dry Weather Flow (DWF) Factors

Land Use Designation	Units	Proposed Unit Flow Factors WWTP Analysis[1]	1996 Master Plan Unit Flow Factor
Commercial	gpd per acre	850	1,040
Heavy Industrial	gpd per acre	850	1,560
Light Industrial	gpd per acre	850	1,040
Mixed Use	gpd per acre	2,300	N/A
Public/Quasi-Public	gpd per acre	660	1,040
Schools	gpd per acre	170	N/A
Residential 1 DU	gpd per du	190	260
Residential 2 DU	gpd per du	190	260
Residential 3 DU	gpd per du	190	260
Residential Mult. DU	gpd per acre	2,040[2]	4,160
Open Space	gpd per acre	0	0
Parks > 10 Acres	gpd per acre	10	N/A
Vacant	gpd per acre	0	0

[1] Includes allowance for dry season GWI.
[2] The proposed Residential Multiple DU unit flow factor can also be represented as 130 gpd per du

5 Future (Buildout) Flow Projections

Buildout DWF projections within the Ultimate SPWA Service Area are based on the unit DWF factors developed for the WWTP analysis above (includes dry season GWI). These flow projections do not include the results of proposed redevelopment/intensification within Roseville and Rocklin which will be analyzed as a separate scenario and presented in the Intensification Land Use TM (No 9c). Buildout dry weather flow projections within the proposed 2005 Regional Service Area are presented in Table 5. Buildout dry weather flow projections within the Ultimate SPWA Service Area (including UGAs) are presented in Table 6. Detailed flow projections for each UGA are presented in Attachment A at the end of this TM.

Table 5 - Buildout Dry Weather Flow Projections Within Proposed 2005 Service Area

		PG WWTP[3]		DC WWTP[4]		2005 Service Area	
Land Use	Unit Flow Factor	Buildout Units (ac or du)	Buildout DWF (mgd)	Buildout Units (ac or du)	Buildout DWF (mgd)	Buildout Units (ac or du)	Buildout DWF (mgd)
Commercial	850 gpd/ac	1,728	1.47	2,890	2.46	4,618	3.93
Heavy Industrial[1]	850 gpd/ac	1,680	1.43	263	0.22	1,943	1.65
Light Industrial[1]	850 gpd/ac	1,221	1.04	637	0.54	1,858	1.58
Mixed Use	2,300 gpd/ac	0	0.00	7	0.02	7	0.02
Public/Quasi-Public[1]	660 gpd/ac	282	0.19	851	0.56	1,133	0.75
Schools	170 gpd/ac	258	0.04	540	0.09	798	0.14
Residential 1 DU	190 gpd/du	26,893	5.11	42,934	8.16	69,827	13.27
Residential 2 DU	190 gpd/du	2	0.0004	2,122	0.40	2,124	0.40
Residential 3 DU	190 gpd/du	12	0.002	720	0.14	732	0.14
Residential Multiple DU	2,040 gpd/ac	594	1.21	606	1.24	1,200	2.45
Open Space	0 gpd/ac	6,034	0.00	3,304	0.00	9,338	0.00
Parks > 10 Acres	10 gpd/ac	270	0.003	360	0.004	630	0.01
Point Sources	Varies gpd/ac	1,043	2.56	91	0.14	1,134	2.70
Placer Ranch[2]	Varies gpd/ac	1,027	0.90	0	0.00	1,027	0.90
West Roseville[2]	Varies gpd/ac	3,162	1.70	0	0.00	3,162	1.70
Placer Vineyard[2]	Varies gpd/ac	0	0.00	1,079	0.85	1,079	0.85
Total (mgd)			**15.7**		**14.8**		**30.5**

[1] Land use category does not include area of parcels associated with point sources identified in Table 3.
[2] Includes portion of development located within the Proposed 2005 Service Area.
[3] Pleasant Grove WWTP Service Area
[4] Dry Creek WWTP Service Area

Table 6 - Buildout Dry Weather Flow Projections Within Ultimate SPWA Service Area

Description of Area	Buildout DWF (mgd)		Total Buildout DWF (mgd)
	PG WWTP[3]	DC WWTP[4]	
Proposed 2005 Service Area	15.7[1]	14.8[2]	30.5
Curry Creek UGA	2.72	--	2.72
Regional University UGA	1.16	--	1.16
Inviro Tech UGA	0.04	--	0.04
Placer UGA	--	0.01	0.01
Orchard Creek	0.02	--	0.02
Placer Ranch	1.29	--	1.29
Placer Vineyards	--	3.04	3.04
SMD-3	--	0.29	0.29
SPMUD UGA	--	1.09	1.09
Creekview UGA	0.47	--	0.47
Sierra Vista UGA	2.04	--	2.04
Total DWF (mgd)	**23.4**	**19.3**	**42.7**

[1] Includes portion of Placer Ranch UGA within the proposed 2005 service area.
[2] Includes portion of Placer Vineyard UGA within the proposed 2005 service area.
[3] Pleasant Grove WWTP Service Area
[4] Dry Creek WWTP Service Area

Attachment A

Urban Growth Area Flow Projections

CURRY CREEK UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	931	0	0
COMMERCIAL	Acres	161	850	136,850
HEAVY INDUSTRIAL	Acres	64	850	54,400
LIGHT INDUSTRIAL	Acres	161	850	136,850
MIXED USE	Acres	64	2300	147,200
PUBLIC/QUASI-PUBLIC	Acres	161	660	106,260
SCHOOLS	Acres	96	170	16,320
RESIDENTIAL 1 DU	DU	8,988	190	1,707,720
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	3,210	130	417,300
Total				2,722,900
Total (mgd)				2.72

REGIONAL UNIVERSITY UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	359	0	0
COMMERCIAL	Acres	0	850	0
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	23	2300	52,900
PUBLIC/QUASI-PUBLIC	Acres	11	660	7,260
SCHOOLS	Acres	10	170	1,700
RESIDENTIAL 1 DU	DU	2,556	190	485,640
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	931	130	121,030
Point Sources				
UNIVERSITY				495,000
Total				1,163,530
Total (mgd)				1.16

INVIRO TECH UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	0	0	0
COMMERCIAL	Acres	0	850	0
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	0	2300	0
PUBLIC/QUASI-PUBLIC	Acres	0	660	0
SCHOOLS	Acres	0	170	0
RESIDENTIAL 1 DU	DU	0	190	0
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	0	130	0
Point Sources				
INVIRO TECH		5		40,000
Total				40,000
Total (mgd)				0.04

PLACER UGA

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	0	0	0
COMMERCIAL	Acres	0	850	0
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	0	2300	0
PUBLIC/QUASI-PUBLIC	Acres	0	660	0
SCHOOLS	Acres	0	170	0
RESIDENTIAL 1 DU	DU	27	190	5,130
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	0	130	0
Total				5,130
Total (mgd)				0.01

ORCHARD CREEK UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	0	0	0
COMMERCIAL	Acres	0	850	0
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	25	850	21,250
MIXED USE	Acres	0	2300	0
PUBLIC/QUASI-PUBLIC	Acres	0	660	0
SCHOOLS	Acres	0	170	0
RESIDENTIAL 1 DU	DU	0	190	0
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	0	130	0
Total				21,250
Total (mgd)				0.02

PLACER RANCH UGA (OUTSIDE 2005 SERVICE AREA)

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	148	0	0
COMMERCIAL	Acres	79	850	67,150
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	32	850	27,285
MIXED USE	Acres	21	2300	48,760
PUBLIC/QUASI-PUBLIC	Acres	0	660	0
SCHOOLS	Acres	30	170	5,100
RESIDENTIAL 1 DU	DU	2,038	190	387,163
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	2,453	130	318,864
Point Sources				
UNIVERSITY				440,000
Total				1,294,322
Total (mgd)				1.29

PLACER VINEYARDS UGA (OUTSIDE 2005 SERVICE AREA)

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	729	0	0
COMMERCIAL	Acres	225	850	191,250
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	87	2300	200,100
PUBLIC/QUASI-PUBLIC	Acres	137	660	90,420
SCHOOLS	Acres	204	170	34,680
RESIDENTIAL 1 DU	DU	9,843	190	1,870,170
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	5,013	130	651,690
Total				3,038,310
Total (mgd)				3.04

SMD-3 UGA

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	0	0	0
COMMERCIAL	Acres	3	850	2,550
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	0	2300	0
PUBLIC/QUASI-PUBLIC	Acres	11	660	7,260
SCHOOLS	Acres	0	170	0
RESIDENTIAL 1 DU	DU	1,268	190	240,920
RESIDENTIAL 2 DU	DU	14	190	2,660
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	250	130	32,500
Total				285,890
Total (mgd)				0.29

SPMUD UGA

DRY CREEK WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	97	0	0
COMMERCIAL	Acres	99	850	84,150
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	0	2300	0
PUBLIC/QUASI-PUBLIC	Acres	0	660	0
SCHOOLS	Acres	0	170	0
RESIDENTIAL 1 DU	DU	5,300	190	1,007,000
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	0	130	0
Total				1,091,150
Total (mgd)				1.09

CREEKVIEW UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	219	0	0
COMMERCIAL	Acres	29	850	24,650
HEAVY INDUSTRIAL	Acres	11	850	9,350
LIGHT INDUSTRIAL	Acres	19	850	16,150
MIXED USE	Acres	11	2300	25,300
PUBLIC/QUASI-PUBLIC	Acres	19	660	12,540
SCHOOLS	Acres	17	170	2,890
RESIDENTIAL 1 DU	DU	1,610	190	305,900
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	575	130	74,750
Total				471,530
Total (mgd)				0.47

SIERRA VISTA UGA

PLEASANT GROVE WATERSHED

Connected Land Use Description	Units	DU or Area (acres)	Unit Flow Factor (gpd)	(gpd)
OPEN SPACE	Acres	412	0	0
COMMERCIAL	Acres	125	850	105,995
HEAVY INDUSTRIAL	Acres	0	850	0
LIGHT INDUSTRIAL	Acres	0	850	0
MIXED USE	Acres	56	2300	129,260
PUBLIC/QUASI-PUBLIC	Acres	28	660	18,678
SCHOOLS	Acres	60	170	10,200
RESIDENTIAL 1 DU	DU	7,167	190	1,361,730
RESIDENTIAL 2 DU	DU	0	190	0
RESIDENTIAL 3 DU	DU	0	190	0
RESIDENTIAL MULTIPLE DU	DU	3,200	130	416,000
Total				2,041,863
Total (mgd)				2.04

Technical Memorandum

RMC Water and Environment

South Placer Regional Wastewater & Recycled Water Systems Evaluation Project

Subject: Market Assessment for Recycled Water Distribution System

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Date: November 29, 2005

Reference: 091-4.05

1 Introduction

This recycled water market assessment technical memorandum (TM) documents the review of existing recycled water planning documents, verifies the current recycled water customers within the South Placer Wastewater Authority's (SPWA) regional service area, and identifies existing and future potential recycled water users as part of the South Placer Regional Wastewater and Recycled Water Systems Evaluation Project. The purpose of this evaluation is to provide a regional planning update of the existing City of Roseville's (City) recycled water studies.

This TM is organized as follows:

- Introduction
- Existing Recycled Water Customers
- Existing Near Future and Existing Potential Recycled Water Customers
- Urban Growth Areas (UGAs)
- Irrigation Demand Pattern
- Design Flowrates
- Summary of Recycled Water Demands
- Bibliography

2 Existing Recycled Water Customers

Existing recycled water customers were identified based on a review of existing studies and discussions with City staff. From this review and discussion with City's staff, there are nine existing recycled water customers. These customers receive recycled water produced at the Dry Creek Wastewater Treatment Plant (DCWWTP), with the exception of the Pleasant Grove Wastewater Treatment Plant (PGWWTP) irrigation and are listed in Table 1. The location of these existing customers and the existing recycled water service area boundary is shown in Figure 1 (Attachment A). The combined demand for these existing customers is approximately 2,045 acre-feet per year (AFY), or an average day demand of 1.83 mgd.

All nine *existing recycled water customers* use the recycled water for irrigation and therefore have a seasonal demand pattern. Three of the nine existing customers (Morgan Creek Golf Course, Woodcreek Golf Course, and Diamond Oaks Golf Course) have recycled water storage facilities (ponds) on-site. The Del Webb/Sun City Recycled Water System delivers to the Del Webb Golf Course, Blue Oaks Park, School House Park, and Del Webb streetscape. Customers are supplied recycled water from the recycled water pump station, and have on-site storage available for the golf course irrigation. The other five existing customers do not have on-site storage facilities and received water directly from the Dry Creek WWTP. The presence of or lack of on-site storage can impact the design flowrate, which can be especially crucial during summer months. This is explained in more detail in Section 6.

Table 1: Existing Recycled Water Customers and Demands

No.	Existing Recycled Water Customer	Annual Demand (AFY)	Annual Average Day Demand (mgd)	Usage	On-Site Storage	Probable Source
1	Del Webb/Sun City RW Pump Station [a]	647	0.58	Irrigation	Partial	DCWWTP
2	Morgan Creek Golf Course [b]	565	0.50	Irrigation	On-Site	DCWWTP
3	Woodcreek Oaks Golf Course [a]	408	0.36	Irrigation	On-Site	DCWWTP
4	Diamond Oaks Golf Course [b]	333	0.30	Irrigation	On-Site	DCWWTP
5	Elliot Park [a]	29	0.03	Irrigation	None	DCWWTP
6	Dry Creek WWTP Irrigation Demand [a]	18	0.02	Irrigation	None	DCWWTP
7	Junction Blvd. Streetscape [a]	5	0.00	Irrigation	None	DCWWTP
8	Pleasant Grove WWTP Irrigation [c]	18	0.02	Irrigation	None	PGWWTP
9	Diamond Creek Ranch [c]	22	0.02	Irrigation	None	DCWWTP
	Total	**2,045**	**1.83**			

Footnotes:
a. Demands from Table 5-1 of Recycled Water Distribution System Feasibility Study, April 2000
b Demands from Table 5-2 of Recycled Water Distribution System Feasibility Study, April 2000
c Demands from Table 5-3 of Recycled Water Distribution System Feasibility Study, April 2000

3 Existing Near Future and Existing Potential Recycled Water Customers

Existing near future recycled water customers are defined as currently developed areas that will be connected to the recycled water distribution system in the near future. *Existing potential recycled water customers* are defined as currently developing areas that have a good potential to use recycled water once developed. The *existing near future* and *existing potential recycled water customers*, shown in Figure 2 (Attachment A), were identified based on the followings:

- Review of existing recycled water study reports,
- Discussions with City staff, and
- Discussions with developers

Table 2 lists the annual and average day delivery demands estimated for each of the identified *existing near future recycled water customers*. This table is an update of Table 5-2 and 5-3 of the Roseville Recycled Water Distribution System Feasibility Study dated April 2000. The update was based on

discussion with City staff where the most feasible future customers were identified. Most of the customers will use recycled water for irrigation purposes; Roseville Energy Park will use recycled water for non-contact cooling water. The majority of the future customers listed in Table 2 will be directly connected to the recycled water distribution system (i.e. no on-site storage). Large users (e.g. West Roseville Specific Plan, Roseville Energy Park, etc.) will be required to have their own storage facility to meet peak hour demands. Therefore, their peak delivery demand is equal to the peak day demand.

The Sierra View Country Club is an existing golf course located in Roseville approximately two miles north of downtown. The estimated maximum day demand is 1.1 MGD (per Bryan Buchanan, City of Roseville). Recycled water will be delivered to Cherry Island Golf Course/Soccer Complex and Gibson Ranch via Dry Creek. The probable source of recycled water to each customer was determined by proximity to a particular WWTP along with location of existing recycled water pipeline. This estimate is based on a dual pipeline system, one pipeline supplied by PGWWTP and a separate system supplied by DCWWTP. It is not finalized whether there will be one interconnected pipeline system or two separate systems. This will be evaluated in the Alternatives Development Technical Memorandum.

Table 2: Existing Near Future Recycled Water Customers and Demands

No.	Existing Near Future Recycled Water Customer	Annual Demand (AFY)	Annual Average Day Demand (mgd)	Usage	On-Site Storage	Probable Source
1	Cherry Island Golf Course and Soccer Complex	500	0.45	Irrigation	On-Site	DCWWTP
2	Diamond Creek Park	100	0.09	Irrigation	On-Site	DCWWTP
3	Diamond Oaks Park	22	0.02	Irrigation	None	DCWWTP
4	Eskaton Retirement Community	25	0.02	Irrigation	None	DCWWTP
5	Fiddyment Park (i.e. Veterans Memorial Park - Phase II)	45	0.04	Irrigation	None	DCWWTP
6	Free Run Park	12	0.01	Irrigation	None	DCWWTP
7	Gibson Ranch County Park [a]	1,303	1.16	Irrigation	On-Site	DCWWTP
8	Homestead Elementary School	7	0.01	Irrigation	None	DCWWTP
9	Homestead Park	48	0.04	Irrigation	None	DCWWTP
10	HP Campus Current Landscaping	156	0.14	Irrigation	None	DCWWTP
11	HP Rezone [b]	45	0.04	Irrigation	None	DCWWTP
12	Roseville Energy Park	1,920	1.71	Cooling Water	On-Site	PGWWTP
13	Sierra View Country Club [c]	482	0.43	Irrigation	On-Site	DCWWTP
14	West Roseville Specific Plan (WRSP)	1,750	1.56	Irrigation	On-Site	PGWWTP
15	Woodcreek West Park (i.e. Bill Sanchee Park)	41	0.04	Irrigation	None	DCWWTP
	Total	**6,456**	**5.76**			

Footnotes:

a. Park will have a pond and propose to have recycled water from the Dry Creek WWTP flow to Dry Creek as credit for diversion by the park downstream (i.e. Dry Creek will be used as a conveyance facility)

b. Western half of existing HP. Per conversion with Steve Snapple of Mayer Construction, the HP Rezone Project will have a 12 acre park to be irrigated with recycled water.

c. Per conversion with Bryan Buchanan at City of Roseville

Existing potential recycled water customers are defined as currently developed areas which may use recycled water. Table 3 lists the estimated annual demand and usages for the *existing potential recycled water customers*. These customers will be required to have their own storage facility to meet peak demands. Both Formica Corporation and Rio Bravo Rocklin Power Plant currently use water from Placer County Water Agency for their non-contact cooling processes. Both cooling processes increase the temperature of the water used during the processes to produce discharges that range from 70°F to as high as 90° F during the summer season. Formica Corporation is currently discharging to Pleasant Grove Creek and their discharge permit was scheduled to expire in June 2005. Formica is facing a potential cease and desist order from the Regional Water Quality Control Board in the near future and is very interested in exploring other discharge options.

The current average day demand for the Rio Bravo Rocklin Power Plant cooling operations ranges from 0.5 mgd to 0.6 mgd. The plant is planning to expand in the near future. The planned expansion would require an additional 0.3 mgd in cooling water.

Table 3: Existing Potential Recycled Water Customers and Demands

Existing Potential Recycled Water Customer	Annual Demand (AFY)	Annual Average Day Demand (mgd)	Usage	On-Site Storage	Probable Source
Formica Corporation (also known as Sierra Plant) [a]	730	0.65	Cooling Water	None	DCWWTP
Rio Bravo Rocklin Power Plant (formally Ultra Power) [b]	983	0.88	Cooling Water	None	DCWWTP
Total	**1,713**	**1.53**			

Footnotes:

a Per conversion with Dan LaTour (Environmental Health and Safety Coordinator) at Formica Corporation.

b. Per conversion with Chuck Salo at Rio Bravo Rocklin (a subsidiary of Constellation Energy).

4 Urban Growth Areas

Urban growth areas (UGAs) west of the City of Roseville are deemed *future potential recycled water customers*. Due to topography, it was determined that at this time it would not be cost effective to serve recycled water to areas east of Highway 65 and Interstate 80 in the City of Roseville. All urban growth areas (UGAs) are listed in Table 4 and shown in Figure 3 (Attachment A). UGAs that connect to the recycled water system will be required to provide storage facilities to meet peak hour demands. This requirement will be specified in the memorandum of understanding (MOU) between the UGAs and SPWA. Peak day demand for Placer Vineyards is estimated to be 3.48 mgd.

Table 4: Urban Growth Area Recycled Water Customers and Demands

Urban Growth Area (UGA) Customer	Annual Demand (AFY)	Annual Average Day Demand (mgd)	Project Size (acre)	Usage	On-Site Storage	Probable Source
Curry Creek [a]	1,860	1.66	3,208	Irrigation	On-Site	PGWWTP
Regional University [b]	790	0.71	1,113	Irrigation	On-Site	PGWWTP
Placer Ranch [c]	1,653	1.48	960	Irrigation	On-Site	PGWWTP
Placer Vineyards [d]	1,560	1.39	4,174	Irrigation	On-Site	PGWWTP
West Roseville Specific Plan MOU Areas (Creekview and Sierra Vista) [e]	1,090	0.97	2,235	Irrigation	On-Site	PGWWTP
Total	**6,953**	**6.21**	**11,690**			

Footnotes:

a. Demand estimates by RMC based on project size and annual demands from other UGAs.
b. De La Salle Specific Plan, Water Master Plan, April 2005, Appendix F, Page F-17 (MacKay & Somps).
c Placer Ranch Recycled Water Market Assessment by HydroScience, April 2005.
d MacKay & Somps (email – March 2005)
e Recycled Water Study for West Roseville Specific Plan Area by HydroScience, May 2003.

5 Irrigation Demand Pattern

Nearly all of the *existing* and *future recycled water customers* will be using recycled water for irrigation purposes. The irrigation demand pattern is an important factor to be considered when evaluating an existing recycled water distribution system and for planning expansions to the distribution system.

Typical local irrigation demands by month are shown in Table 5. The evapotranspiration rates are from the California Irrigation Management Information System (CIMIS) database. The precipitation data shown is based on 1850-1998 historical data for Sacramento collected by DWR. Irrigation demand for turf grasses is calculated using the following equation: (HydroScience, 2000)

$$ID = \frac{(ET - Pe_p)l_r}{e_i}$$

Where:

ID = Irrigation demand in inches

ET = Evapotranspiration for turf grasses in the City

P = Average precipitation, DWR

E_p = Precipitation irrigation efficiency, 0.8. Assumes 20% of rainfall during growing season is lost to evaporation, runoff, etc.

l_r = Loss rate, equal to 1.1. This assumes that approximately 10% of the applied water passes through the grass root zone and it lost.

e_t = Irrigation efficiency, equal to 0.8 to 0.9 depending on season. This assumes that 10 to 20% of the applied irrigation is lost to the environment.

For additional details on the evapotranspiration and irrigation demand calculations, refer to the Roseville Recycled Water Distribution System Feasibility Study dated April 2000.

Table 5: Typical Local Irrigation Demands [a]

Month	ET-Turf Grass (inches)	Precipitation (inches)	Irrigation Demand (inches)	Percentage of Annual Irrigation Demand
January	0.88	3.57	0.0	0%
February	1.36	3.24	0.0	0%
March	2.48	2.45	0.6	1%
April	3.76	1.52	3.3	8%
May	4.96	0.71	5.7	13%
June	6.16	0.24	8.0	18%
July	6.80	0.02	9.2	21%
August	5.84	0.04	8.0	18%
September	4.48	0.24	5.8	13%
October	2.96	0.97	2.8	6%
November	1.28	1.68	0.0	0%
December	0.80	3.63	0.0	0%
Total	**41.76**	**18.31**	**43.4**	**100%**

Footnotes:

a Demands from Table 4-1 of Recycled Water Distribution System Feasibility Study, April 2000

July has the highest irrigation demand with 9.2 inches and will be used to determine design flowrates to evaluate the recycled water distribution system. In the months of November through February, negative irrigation demand values were deemed as zero irrigation demand. Irrigation demand is not projected during those months.

6 Design Flowrates

6.1 Supply Analysis

Design flowrates are affected by the volume was recycled water demand, the time frame for which it is used as well as supply. The City has determined that Urban Growth Areas shall only receive the amount of recycled water they produce in wastewater on an average day in July. Table 6 compares the recycled water demands of Urban Growth Areas to projected average dry weather flows (ADWF)

Table 6: Comparison of Recycled Water Demands to Projected Wastewater Generation

Customer	Demand During Irrigation Period (gpm)	Projected Wastewater Flow (mgd)
Urban Growth Areas		
Curry Creek	2,851 (4.10 mgd)	2.69 mgd
Regional University	1,211 (1.74 mgd)	1.16 mgd
Placer Ranch	2,534 (3.64 mgd)	2.05 mgd
Placer Vineyards	2,391 (3.44 mgd)	3.89 mgd
WRSP MOU Areas (Creekview and Sierra Vista)	1,671 (2.40 mgd)	1.89 mgd
Totals	**10,658 gpm (15.32 mgd)**	**11.68 mgd**

For most Urban Growth Areas, recycled water demand exceeds projected wastewater flow, with the exception of Placer Vineyards. Table 7 displays the total water delivered to Urban Growth Areas annually. These values are calculated per month based upon percent irrigation demands listed in Table 5. A breakdown of recycled water delivered per month is in Attachment B. To deliver recycled water to customers year round, the number of recycled water customers will be reduced based on the ratio of wastewater generation to recycled water demand in the peak demand month, July. The number of customers will remain the same throughout the year. The amount of recycled water provided from the original amount is also found in Appendix B.

Table 7: Total Delivered Water to Urban Growth Areas

Customer	Annual Recycled Water Demand (MG)	Annual Wastewater Generation (MG)	Annual Recycled Water Provided (MG) [a]
Urban Growth Areas			
Curry Creek	606 (1,860 AF)	982 (3,013 AF)	393 (1,206 AF)
Regional University	259 (790 AF)	423 (1,298 AF)	168 (515 AF)
Placer Ranch	540 (1,653 AF)	748 (2,296 AF)	302 (926 AF)
Placer Vineyards	507 (1,560 AF)	1,420 (4,357 AF)	507 (1,560 AF)
WRSP MOU Areas (Creekview and Sierra Vista)	354 (1,090 AF)	690 (2,117 AF)	280 (859 AF)
Totals	**2,266 MG (6,953 AF)**	**4,263 MG (13,081 AF)**	**1,650 MG (5,066 AF)**

Footnotes:

a. 'Recycled water provided' is determined by the difference in amount of requested recycled water demand from Table 4. The amount of customers will be reduced based on the ratio of wastewater generated to recycled water demand during the peak demand month (July). For example, Curry Creek will produce 83 MG of wastewater in July, while the recycled water demand is 128 MG. The ratio of supply to demand is 0.65. The amount of recycled water provided will be 65% of the original recycled water demand, therefore the City will be able to supply recycled water to all the customers throughout the year.

6.2 Irrigation Design Flowrates

Design flowrates are a combination of irrigation and non-irrigation flowrates. For the purposes of evaluating the existing recycled water distribution system and sizing the expansion of the recycled water

distribution system, it will be assumed that irrigation occurs evenly throughout the month of July and therefore the daily irrigation volume is equal to the July irrigation volume divided by 31. This assumption is reasonable because of the conservative nature of the irrigation demand equation. The irrigation design flowrates for all customers are summarized in Table 8.

For customers with on-site storage, this daily irrigation demand is spread evenly throughout the day as the storage tank/pond is filled throughout the day. In the future it may be possible to restrict storage filling operations to occur only during the non-irrigation periods of the day, but at this time, that level of demand management is not necessary.

Table 8: Recycled Water as System Design Flowrates in July for Irrigation Usage

Customer	July Monthly Volume (AF)[a]	July Daily Volume (gal)	July Flowrate During Irrigation Period (gpm)[b]	July Flowrate During Non-Irrigation Period (gpm)	Probable Source
Existing Customer					
Del Webb/Sun City RW Pump Station [c]	122	1,285,356	893	893	DCWWTP
	14	142,817	265	0	DCWWTP
Morgan Creek Golf Course	119	1,247,168	866	866	DCWWTP
Woodcreek Oaks Golf Course	86	900,610	625	625	DCWWTP
Diamond Oaks Golf Course	70	735 057	510	510	DCWWTP
Elliot Park	6 1	64,014	119	0	DCWWTP
Dry Creek WWTP Irrigation Demand	3 8	39,733	74	0	DCWWTP
Junction Blvd. Streetscape	1 1	11,037	20	0	DCWWTP
Pleasant Grove WWTP Irrigation	3 8	39 733	74	0	PGWWTP
Diamond Creek Ranch	4 6	48,562	90	0	DCWWTP
Subtotal	*429*	*4,514,087 (4.5 mgd)*	*3,536*	*2,893*	
Existing Near Future Customers					
Cherry Island Golf Course	105	1,103,689	766	766	DCWWTP
Diamond Creek Park	21	220,738	153	153	DCWWTP
Diamond Oaks Park	4 6	48,562	90	0	DCWWTP
Eskaton Retirement Community	5 3	55,184	102	0	DCWWTP
Fiddyment Park (i e. Veterans Memorial Park – Phase II)	9 5	99,332	184	0	DCWWTP
Free Run Park	2.5	26.489	49	0	DCWWTP
Gibson Ranch County Park	274	2,876,213	1,997	1,997	DCWWTP
Homestead Elementary School	1.5	15,452	29	0	DCWWTP
Homestead Park	10	105,954	196	0	DCWWTP
HP Campus Current Landscaping	33	344,351	638	0	DCWWTP
HP Rezone	9 5	99,332	184	0	DCWWTP
Sierra View Country Club	101	1,063,956	739	739	DCWWTP
West Roseville Specific Plan (WRSP) [d]	368	3,862,911	2,683	2,683	PGWWTP
Woodcreek West Park	8 6	90,502	168	0	DCWWTP
Subtotal	*953*	*10,012,665 (10.0 mgd)*	*7,980*	*6,338*	
Urban Growth Areas					
Curry Creek [e]	256	2,690,000	1,868	1,868	PGWWTP
Regional University [e]	110	1,160,000	806	806	PGWWTP
Placer Ranch [e]	195	2,050 000	1,424	1,424	PGWWTP
Placer Vineyards	328	3,443,509	2,391	2,391	PGWWTP
WRSP MOU Areas (Creekside and Sierra View) [e]	180	1,890,000	1,313	1 313	PGWWTP
Subtotal	*1,069*	*11,233,509 (11.2 mgd)*	*7,801*	*7,801*	
Total DCWWTP Irrigation Demand	**1,011**	**10,624,109 (10.6 mgd)**	**8,759 (12.6 mgd)**	**6,550 (9.4 mgd)**	
Total PGWWTP Irrigation Demand	**1,440**	**15,136,153 (15.1 mgd)**	**10,557 (15.2 mgd)**	**10,484 (15.1 mgd)**	
Total Irrigation Demand	**2,451**	**25,760,262 (25.8 mgd)**	**19,317 (27.8 mgd)**	**19,981 (28.7 mgd)**	

Footnotes:

a. July demand volume calculated by the multiplying by July's Percentage of Annual Irrigation Demand by the Annual Demand.
b. Assumed that customers without on-site storage will use recycled water from 9:00 PM to 6:00 AM only.
c. Recycled water demand for Del Webb is assumed to be 90% from on-site storage and 10% direct connection.
d Annual irrigation demand is separated from the annual Roseville Energy Park demand. July demand for irrigation is calculated using methods described.
e Updated demand values taken from Table 6.

For the purposes of this evaluation, it is assumed that irrigation with recycled water is restricted to a nine hour window at night. Therefore, for irrigation customers without on-site storage, the peak hour demand is determined by multiplying the daily irrigation demand by 2.67 (i.e. 24/9) as the entire 24 hour volume of irrigation water is applied in a nine hour period.

It is assumed that the Del Webb/Sun City irrigation demand is split between the golf course (90%) and streetscape irrigation (10%). It is also assumed that the golf course has on-site storage.

6.3 Non-Irrigation (Industrial) Flowrates

Customers who will use recycled water for industrial processes are assumed to use an equal amount year round. These customers are listed along with the monthly and daily volume and daily flowrate in Table 9. Roseville Energy Park, Formica Corporation and Rio Bravo Rocklin are assumed to use a consistent amount of water throughout the year. The annual volume of water is divided by 12 to obtain monthly volume and divided by 365 to get daily volume. It is understood that power plant demands can fluctuate however, due to lack of detailed information, these simplifying assumptions were made.

Table 9: Recycled Water as System Design Flowrates for Non-Irrigation Usage

Customer	Monthly Volume (AF)	Daily Volume (gal)	Daily Flowrate (gpm)	Probable Source
Existing Near Future Customers				
Roseville Energy Park [a]	160	1,714,066 (1.7 mgd)	1,190	PGWWTP
Existing Potential Customers				
Formica Corporation [b]	61	651,702	453	DCWWTP
Rio Bravo Rocklin Power Plant [b]	82	877,566	609	DCWWTP
Subtotal	*143*	*1,529,268 (1.5 mgd)*	*1,062*	
Total	**303**	**3,243,334 (3.2 mgd)**	**2,252**	

Footnotes:

a. California Energy Commission, Roseville Energy Park Commission Decision April 2005. The plant will use a maximum demand of 1.71 MGD.
b. The industrial users Formica Corporation and Rio Bravo Rocklin Power Plant are assumed to have the same demand in July as any other month throughout the year: annual demand divided by 12

7 Summary of Recycled Water Demands

This technical memorandum presented both annual recycled water demand (Table 10) and peak day design flowrates (Table 11). This information is summarized in the following tables. Urban Growth Area demands are taken from *Annual Recycled Water Provided* in Table 7.

Table 10: Summary of Annual Recycled Water Demands

Customer	Annual Demand (AFY)	Annual Average Day Demand (mgd)	Annual Irrigation Demand (AFY)	Annual Non-Irrigation Demand (AFY)
Existing Customers	2,045	1.83	2,045	0
Existing Near Future Customers	6,456	5.76	4,536	1,920
Existing Potential Customers	1,713	1.53	0	1,713
Urban Growth Area Customers	5,917	5.28	5,917	0
Total	**16,131**	**14.40**	**12,498**	**3,633**

Recycled water demands are summarized in Table 11. The recycled water source (WWTP) was taken from Tables 1 through 3, and 7.

Table 11: Summary of Future Conveyance Design (July) Flowrates [a,b]

Customer	Daily Volume (gal)	Flowrate During Irrigation Period (gpm)	Flowrate During Non-Irrigation Period (gpm)
Dry Creek WWTP			
Existing Customers	4,474,355 (4.5 MGD)	3,462	2,895
Existing Near Future Customers	6,028,349 (6.0 MGD)	5,072	3,656
Existing Potential Customers	1,529,268 (1.5 MGD)	1,062	1,062
Urban Growth Area Customers	0	0	0
Transfer from PGWWTP to Woodcreek Tank [c]	-1,008,000 (-1.0 mgd)	-700	-700
Total Dry Creek WWTP Demand	**11,023,972 (11.0 MGD)**	**8,896 (12.8 mgd)**	**6,913 (9.9 mgd)**
Pleasant Grove WWTP			
Existing Customers	39,733 (0.04 mgd)	74	0
Existing Near Future Customers	5,698,382 (5.7 mgd)	3,873	3,873
Existing Potential Customers	0	0	0
Urban Growth Area Customers	11,233,509 (11.2 mgd)	7,801	7,801
Transfer from PGWWTP to Woodcreek Tank [c]	1,008,000 (1.0 mgd)	700	700
Total Pleasant Grove WWTP Demand	**17,979,624 (17.9 mgd)**	**12,448 (17.9 mgd)**	**12,374 (17.8 mgd)**
Total Recycled Water Demand	**29,003,596 (29.0 mgd)**	**21,569 (31.1 mgd)**	**19,286 (27.8 mgd)**

Footnotes:

a. July flowrates are the design flowrates
b. It is assumed irrigation demand is during the hours of 9:00 PM to 6:00 AM
c. It is estimated that approximately 700 gpm of recycled water is needed from the Pleasant Grove system to supply the Dry Creek System via the storage tank at Woodcreek Oaks Golf Course. This is listed as Woodcreek Storage Tank. Transmission of this recycled water will be done via an existing decommissioned sewer force main (after it has been cleaned) and connection to be built during WRSP Phase 1

Recycled water will be transferred to the Woodcreek storage tank and would be an additional supply to the Dry Creek system. It will be a seasonal demand on the Pleasant Grove system. Preliminary results from the ongoing SPWA Trunk Sewer Evaluation indicate a total wastewater flow of 40.75 mgd average dry weather flow (ADWF) for both Dry Creek and Pleasant Grove WWTPs. These preliminary results indicate there will be sufficient recycled water supply to meet the daily demand of 29 mgd shown above. The projected wastewater flow of 19.16 mgd ADWF to DCWWTP will be sufficient to meet the recycled water demands and maintain the minimum 4 million gallon discharge to Dry Creek. The projected ADWF of 21.59 mgd to PGWWTP will provide enough supply to supply recycled water demands.

8 Bibliography

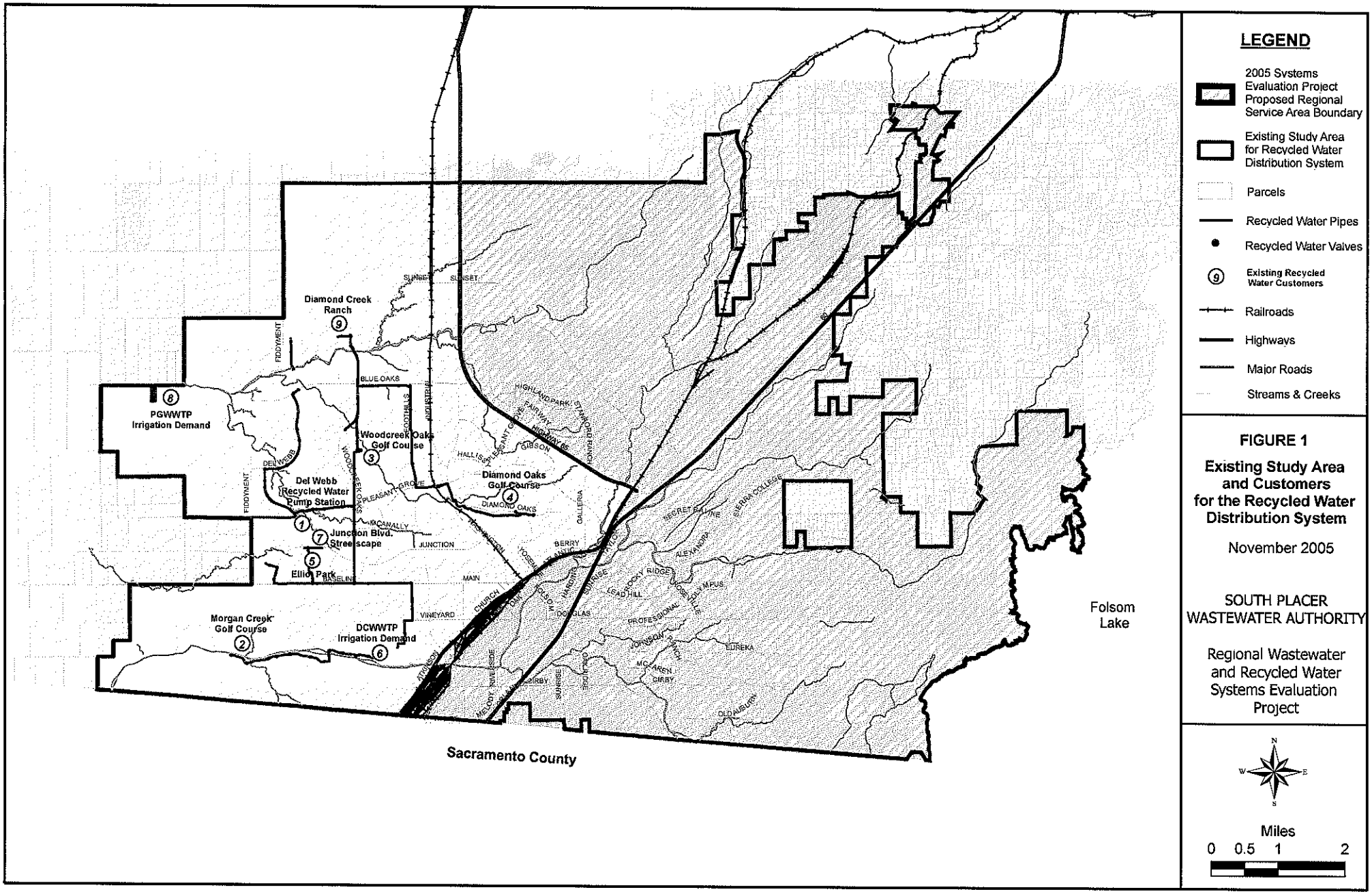
California Energy Commission. Roseville Energy Park Commission Decision April 2005.

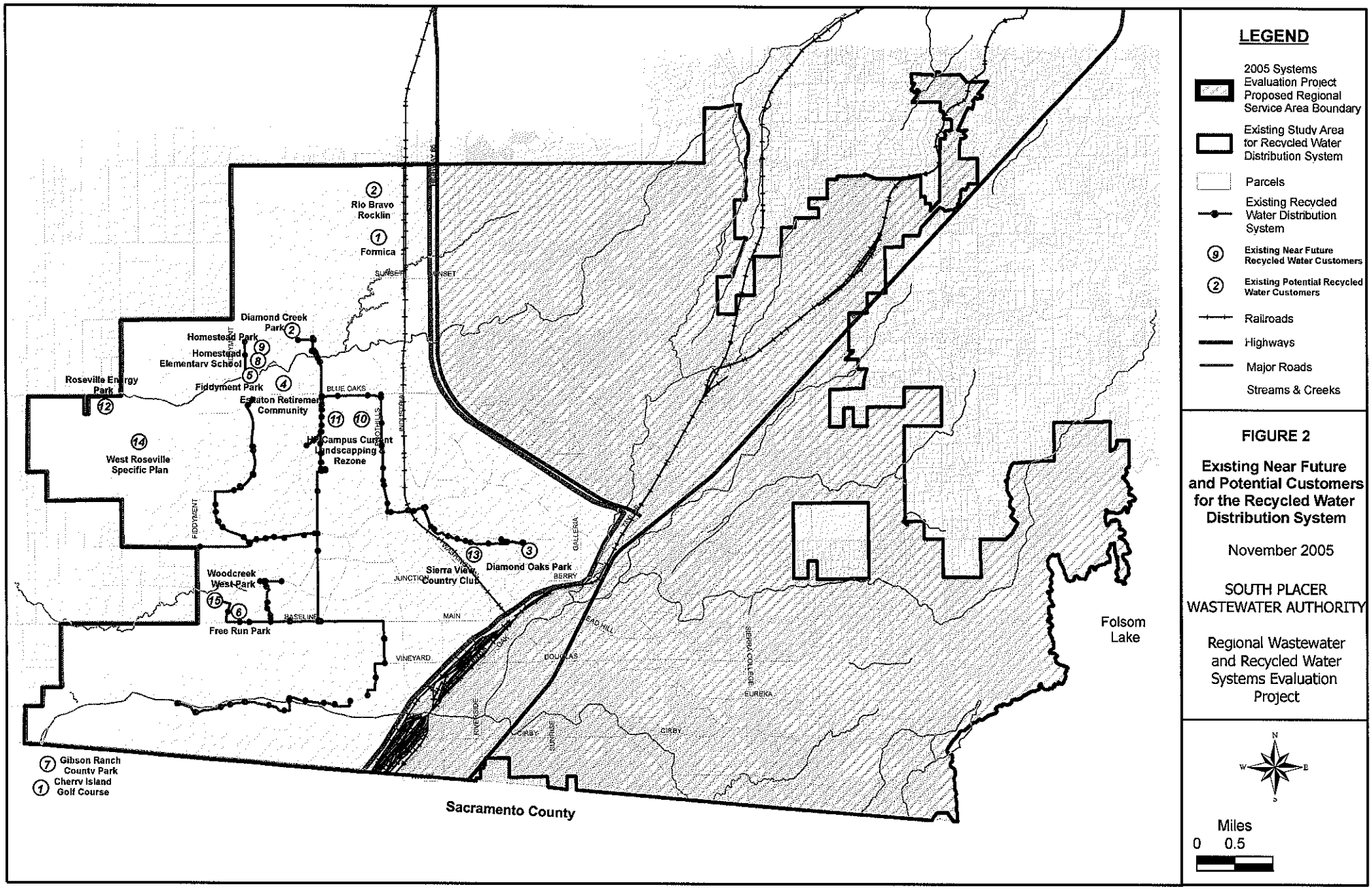
HydroScience Engineers. City of Roseville Recycled Water Distribution System Feasibility Study. April 2000.

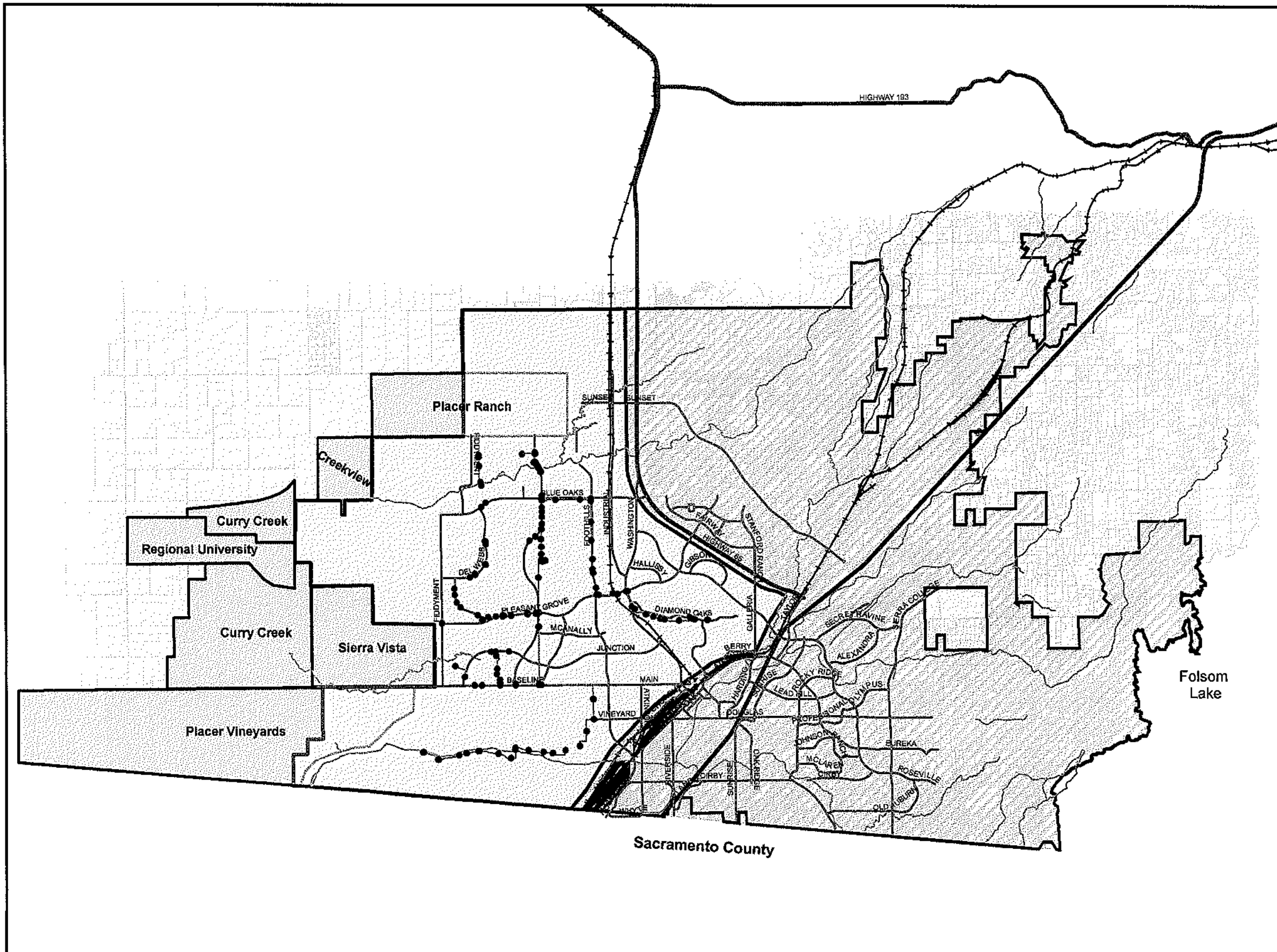
HydroScience Engineers. Recycled Water Study for West Roseville Specific Plan Area. May 2003

Attachment A

TM Figures


LEGEND
2005 Systems Evaluation Project Proposed Regional Service Area Boundary
Existing Study Area for Recycled Water Distribution System
Parcels
Recycled Water Pipes
Recycled Water Valves
9 Existing Recycled Water Customers
Railroads
Highways
Major Roads
Streams & Creeks
FIGURE 1
Existing Study Area and Customers for the Recycled Water Distribution System
November 2005
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Systems Evaluation Project
N
W
E
S
Miles
0 0.5 1 2
Diamond Creek Ranch
9
PGWWTP Irrigation Demand
8
Woodcreek Oaks Golf Course
3
Diamond Oaks Golf Course
4
Del Webb Recycled Water Pump Station
1
Junction Blvd. Streetscape
7
Ellion Park
5
Morgan Creek Golf Course
2
DCWWTP Irrigation Demand
6
Folsom Lake
Sacramento County


LEGEND
2005 Systems Evaluation Project Proposed Regional Service Area Boundary
Existing Study Area for Recycled Water Distribution System
Parcels
Existing Recycled Water Distribution System
9 Existing Near Future Recycled Water Customers
2 Existing Potential Recycled Water Customers
Railroads
Highways
Major Roads
Streams & Creeks
FIGURE 2
Existing Near Future and Potential Customers for the Recycled Water Distribution System
November 2005
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Systems Evaluation Project
N
W
E
S
Miles
0 0.5
2 Rio Bravo Rocklin
1 Formica
Diamond Creek Park 2
Homestead Park 9
Homestead Elementary School 8
5
Fiddyment Park 4
Roseville Energy Park 12
Eskaton Retirement Community 11 10
14 West Roseville Specific Plan
HP Campus Current Landscapping & Rezone
13 Sierra View Country Club
3 Diamond Oaks Park
Woodcreek West Park 15
6 Free Run Park
7 Gibson Ranch County Park
1 Cherry Island Golf Course
Folsom Lake
Sacramento County
BLUE OAKS
FIDDYMENT
BASELINE
MAIN
VINEYARD
BERRY
DOUGLAS
EUREKA
SIERRA COLLEGE
GALLERIA
RIVERSIDE
SUNRISE
CIRBY



LEGEND

- 2005 Systems Evaluation Project Proposed Regional Service Area Boundary
- Existing Study Area for Recycled Water Distribution System
- Future Addition to Existing Study Area for Recycled Water Distribution System
- Parcels
- Railroads
- Highways
- Major Roads
- Streams & Creeks

FIGURE 3

Future Study Area for Recycled Water Distribution System

November 2005

SOUTH PLACER WASTEWATER AUTHORITY

Regional Wastewater and Recycled Water Systems Evaluation Project

Miles

3 1.5 0

Attachment B

Urban Growth Area
Annual Demand Breakdown

Curry Creek					
Month	Percent of Annual Demand	Recycled Water Demand (AF)	Recycled Water Demand (MG)	Average Dry Weather Monthly Wastewater Generation (MG)	Recycled Water Provided to Customers (MG) [a]
Jan	0.00	0	0	83	0
Feb	0.00	0	0	75	0
Mar	1.38	26	8	83	5
Apr	7.60	141	46	81	30
May	13.13	244	80	83	52
Jun	18.43	343	112	81	72
Jul	21.20	394	128	83	83
Aug	18.43	343	112	83	72
Sep	13.36	248	81	81	52
Oct	6.45	120	39	83	25
Nov	0.00	0	0	81	0
Dec	0.00	0	0	83	0
	Totals	**1,860**	**606**	**982**	**393**

Regional University					
Month	Percent of Annual Demand	Recycled Water Demand (AF)	Recycled Water Demand (MG)	Average Dry Weather Monthly Wastewater Generation (MG)	Recycled Water Provided to Customers (MG) [a]
Jan	0.00	0	0	36	0
Feb	0.00	0	0	32	0
Mar	1.38	11	4	36	2
Apr	7.60	60	20	35	13
May	13.13	104	34	36	22
Jun	18.43	146	48	35	31
Jul	21.20	167	55	36	36
Aug	18.43	146	48	36	31
Sep	13.36	106	35	35	22
Oct	6.45	51	17	36	11
Nov	0.00	0	0	35	0
Dec	0.00	0	0	36	0
	Totals	**790**	**259**	**423**	**168**

WRSP MOU (Creekview and Sierra Vista)					
Month	Percent of Annual Demand	Recycled Water Demand (AF)	Recycled Water Demand (MG)	Average Dry Weather Monthly Wastewater Generation (MG)	Recycled Water Provided to Customers (MG) [a]
Jan	0.00	0	0	59	0
Feb	0.00	0	0	53	0
Mar	1.38	15	5	59	4
Apr	7.60	83	27	57	21
May	13.13	143	46	59	37
Jun	18.43	201	65	57	52
Jul	21.20	231	75	59	59
Aug	18.43	201	65	59	52
Sep	13.36	146	47	57	37
Oct	6.45	70	23	59	18
Nov	0.00	0	0	57	0
Dec	0.00	0	0	59	0
	Totals	**1,090**	**354**	**690**	**280**

Placer Ranch					
Month	Percent of Annual Demand	Recycled Water Demand (AF)	Recycled Water Demand (MG)	Average Dry Weather Monthly Wastewater Generation (MG)	Recycled Water Provided to Customers (MG) [a]
Jan	0.00	0	0	64	0
Feb	0.00	0	0	57	0
Mar	1.38	23	7	64	4
Apr	7.60	126	41	62	23
May	13.13	217	71	64	40
Jun	18.43	305	100	62	56
Jul	21.20	350	114	64	64
Aug	18.43	305	100	64	56
Sep	13.36	221	72	62	40
Oct	6.45	107	35	64	20
Nov	0.00	0	0	62	0
Dec	0.00	0	0	64	0
	Totals	**1,653**	**540**	**748**	**302**

Placer Vineyards					
Month	Percent of Annual Demand	Recycled Water Demand (AF)	Recycled Water Demand (MG)	Average Dry Weather Monthly Wastewater Generation (MG)	Recycled Water Provided to Customers (MG) [a]
Jan	0.00	0	0	121	0
Feb	0.00	0	0	109	0
Mar	1.38	22	7	121	7
Apr	7.60	119	39	117	39
May	13.13	205	67	121	67
Jun	18.43	288	93	117	93
Jul	21.20	331	107	121	107
Aug	18.43	288	93	121	93
Sep	13.36	208	68	117	68
Oct	6.45	101	33	121	33
Nov	0.00	0	0	117	0
Dec	0.00	0	0	121	0
	Totals	**1,560**	**507**	**1,420**	**507**

UGA	Reduction of Customers from Original Amount
Creekview	79%
Curry Creek	65%
Placer Ranch	56%
Placer Vineyards	no reduction
Regional University	65%
Sierra Vista	79%

[a] The amount of customers will be reduced based on the ratio of wastewater generated to recycled water demand during the peak demand month (July).
For example, Curry Creek will produce 83 MG of wastewater in July, while the recycled water demand is 128 MG. The ratio of supply to demand is 0.65.
The amount of recycled water provided will be 65% of the original recycled water demand, therefore the City will be able to supply recycled water to all the customers throughout the year.

November 25, 2005					
BUSINESS	**BIN SIZE**	**# OF BINS**	**YARDS**	**ADDRESS**	**COMMENTS**
CHEVRON		1	4	1400 E ROSEVILLE PW	
ROSEVILLE MEDICAL	5YD	2	10	2 MEDICAL PZ	
SUTTER RSVL MED CENTER		2	8	3 MEDICAL PZ	
SUTTER SURGERY CENTER	3YD	2	6	4 MEDICAL PZ	
SECRET RAVINE COMMON AREA		1	5	1421 SECRET RAVINE PW	
THE PHOENICIAN		4	16	1501 SECRET RAVINE PW	**GATE CODE 2396**
STONERIDGE APTS		7	28	2801 ALEXANDRA DR	
SILVER RIDGE APTS	3YD	3	9	1101 STONE CANYON DR	**added 1 bin on 4/9/03**
ISLANDS RESTAURANT	4YD	3	12	1902 TAYLOR RD	
THE COURTYARD		1	6	1920 TAYLOR RD	
THE RESIDENCE INN		1	8	1930 TAYLOR RD	**CLOSE GATES!!!!!!!!**
CATTLEMENS		1	6	2000 TAYLOR RD	
MEINKE MUFFLER		1	5	2010 TAYLOR RD	
ROSEVILLE YAMAHA		1	6	2014 TAYLOR RD	
ROSEVILLE O & I		1	8	1101 PLUMBER WY	
AFFORDABLE DETAIL		1	2	1400 PLUMBER WY #400	
ROYCE AIR		1	8	1400 PLUMBER LANE #300	
DIAMOND AUTO GLASS		1	4	PLUMBER WY	
HILTON GARDEN INN		1	6	1951 TAYLOR RD	
TAHOE JOES		1	6	1905 TAYLOR RD	
LARKSPUR LANDING		1	6	1931 TAYLOR RD	
GOLFLAND SUNSPLASH		1	4	1893 TAYLOR RD	COMPACTOR
SHELL STATION		1	3	1813 TAYLOR RD	
BROOKFIELDS		1	4	1817 TAYLOR RD	
IN & OUT BURGER		1	6	1803 TAYLOR RD	
PLEASANT GROVE INVESTORS		1	3	943 PLEASANT GROVE BL	
HIGHLAND CREEK CENTER 6YDS		6 1	36 4	1010 1020 & 1070 PLEASANT GROVE	
SAFEWAY		1	6	1080 PLEASANT GROVE BL	
HIGHLAND CREEK CENTER		1	3	1060 PLEASANT GROVE BL	Behind Pasghetti near Longs
HIGHLAND CREEK CENTER		1	6	1050 PLEASANT GROVE BL	behind Waffle Barn
HIGHLAND CREEK CENTER	4YD	2	8	1090 PLEASANT GROVE BL	NEAR TOGO'S/BASKIN ROBBINS
HIGHLAND CREEK APTS	6YD	5	30	800 GIBSON DR	**please push all the bins to the back of the enclosure against the wall**
	4YD	2	8		
TRILLIUM APTS		6	36	301 GIBSON DR	
GREEN ACRES NURSERY		1	8	901 GALLERIA BL	
HEALD COLLEGE		1	6	7 SIERRA GATE PZ	
SIERRA GATE #1 & #5	4YD	1	4	1 SIERRAGATE PZ	
	3YD	2	6	5 SIERRAGATE PZ	
ROSE VILLAGE		1	6	201 HARDING BL	
TRADER JOES		1	4	1117 ROSEVILLE SQ	

November 25, 2005					
BUSINESS	BIN SIZE	# OF BINS	YARDS	ADDRESS	COMMENTS
PARK ROSEVILLE		1	4	275 FOLSOM RD	
KOI GARDEN BUFFET		1	4	380 ROSEVILLE SQ	
RSVL SQ 1 2 3,4,8	4YD 5YD 6YD	1 2 2	4 10 12		
TACQUERIA SAN JOSE		1	4	1025 DOUGLAS BL	
BAKER BENS		1	2	1045 DOUGLAS BL	NOTIFY OFFICE IMMEDIATELY OF ANY PROBLEMS
JACK IN THE BOX		1	4	1100 DOUGLAS BL	
BURGER KING		1	6	111 S HARDING BL	
PACIFIC SCENE - BOTH	3YD	1	3	1120 DOUGLAS BL	
	4YD	1	4		
ACE HARDWARE		1	4	108 HARDING BL	
DOLLAR TREE		1	6	108B HARDING BL	
ROSEVILLE HOSPICE THRIFT		1	4	212 HARDING BL #Q	
SHERWIN WILLIAMS		1	3	212 HARDING BL #O	
MALY'S OF CALIFORNIA		1	2	212 HARDING BL #L	
BIG LOTS		1	8	212 HARDING BL	
ROGER DUNN GOLF SHOP		1	3	212 HARDING BL #F	
ROSEVILLE INN		1	6	220 HARDING BL	BEST WESTERN
EXTENDED STAY 6yard		2	12	1000 LEADHILL BL	
CLAIM JUMPERS only one bin goes today	4 YD	1	4	250 HARDING BL	
UNOCAL		1	3	290 N. SUNRISE AV	
OXFORD SUITES		1	4		MAKE SURE YOU RECONNECT THE HYDRAULIC LINES AFTER EMPTY
SHEA PROPERTIES		1	3	516 GIBSON DR	
TOTAL BINS		**101**	**430**		

Technical Memorandum

RMC
Water and Environment

SOUTH PLACER WASTEWATER AUTHORITY (SPWA) WASTEWATER AND RECYCLED WATER SYSTEMS EVALUATION PROJECT

Subject: **Wet Weather Flow Projection for the Ultimate SPWA Service Area (Including Urban Growth Areas) – Draft (TM No. 2c)**

Prepared For: Art O'Brien – City of Roseville

Prepared by: Pete Bellows/Chris Peters – Brown and Caldwell

Reviewed by: Dave Richardson/Gisa Ju – RMC

Date: January 17, 2006

Reference: 0091-004 Task 2

1 Introduction

This technical memorandum (TM) summarizes the wet weather wastewater flow projections for buildout conditions within the Ultimate SPWA service area. This includes flows generated within the proposed 2005 Service Area boundary and flows generated within the Urban Growth Areas (UGAs) located outside the proposed 2005 Service Area boundary. Wet weather flow projections are used with the hydraulic model to perform the hydraulic assessment of the collection system and for the analysis of the SPWA wastewater treatment plants. Wet weather flows are based on flow monitoring data which are presented in the Flow Monitoring TM (No. 2d).

2 Wastewater Flow Components

Typically, wastewater consists of three components: base sanitary flow (BSF), groundwater infiltration (GWI), and rainfall dependent infiltration and inflow (RDI/I). These components are shown on Figure 1. BSF and GWI during dry weather constitute DWF. DWF components were previously discussed in the Dry Weather Flow Projection TM (No. 2a). GWI can vary seasonally as rainfall causes localized groundwater levels to rise during the winter. This phenomenon occurs within the SPWA service area and results in increased GWI in some areas during the wet season. RDI/I occurs during rainfall conditions and causes the wastewater flow to increase. Together, BSF, GWI, wet season GWI, and RDI/I constitute wet weather flow.

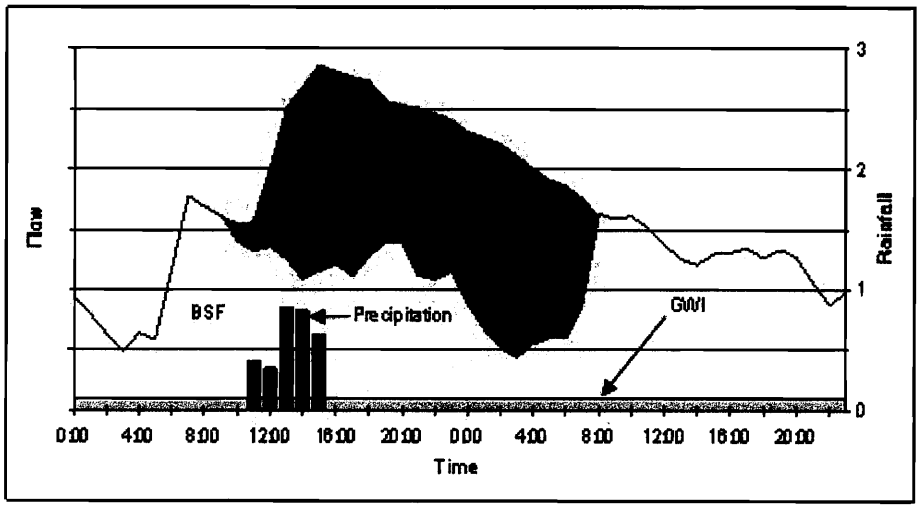


Figure 1 – Wastewater Components

3 Wet Weather Flow and Precipitation Data

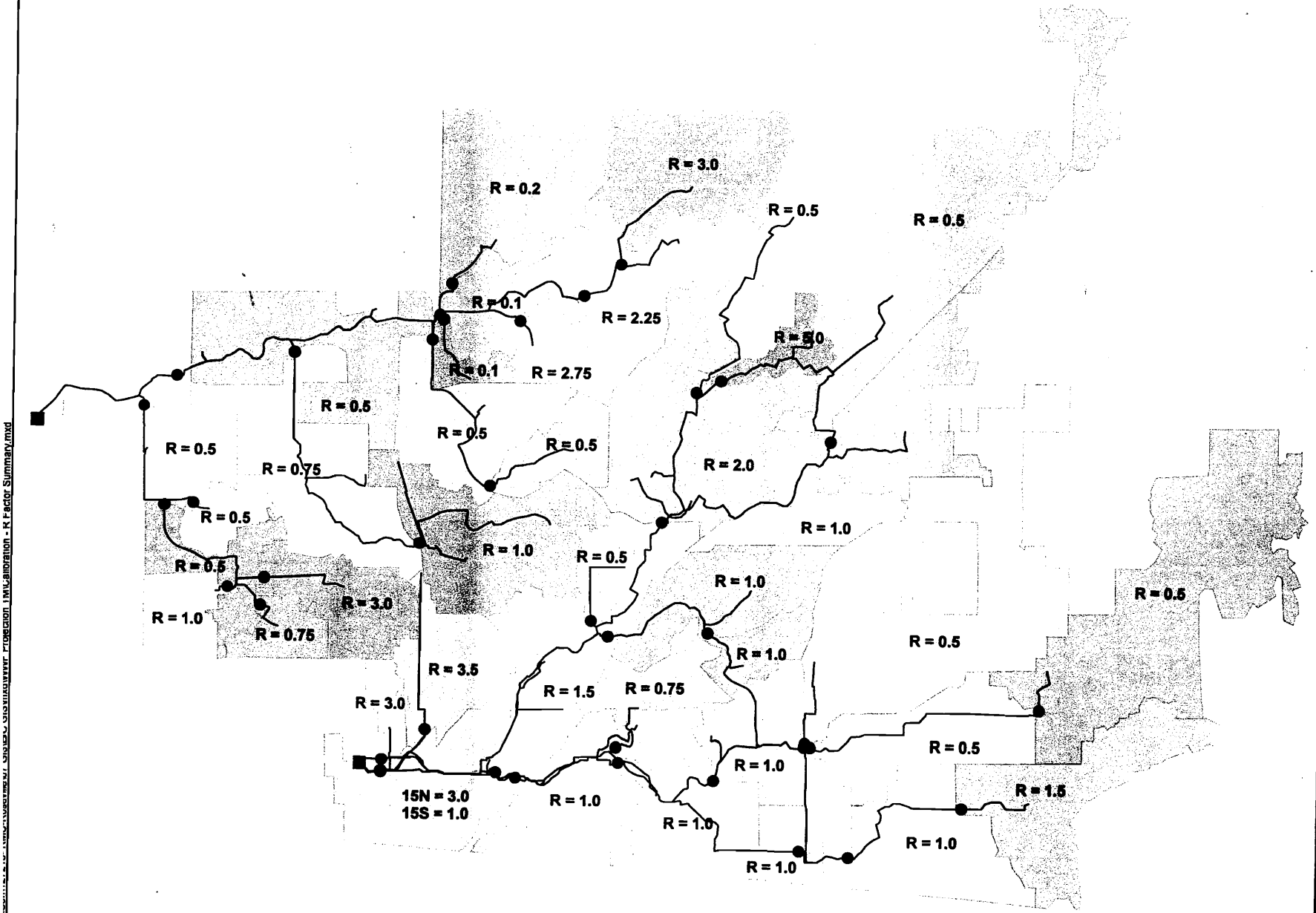
Wet weather flow data was collected at 43 locations during the winter of 2005. The monitor network consisted of 37 temporary flow monitors and 6 permanent flow monitors. 27 of the flow monitor sites (including the WWTP monitors) were within the City of Roseville and were utilized for the Roseville Hydraulic Modeling Project. The rest of the monitors were located in Placer County and SPMUD. Some of the temporary monitors located outside of Roseville were located to verify the data from several permanent meter sites. For the wet weather analysis, flow data from the network was evaluated from late January through March 2005. The flow monitor locations utilized for the SPWA wet weather flow projections are listed in Table 1 and are shown on Figure 2.

Precipitation information during the wet weather flow monitoring period was collected at 17 permanent rain gauge sites in the City of Roseville and Placer County and one temporary rain gauge sites in SPMUD. The rain gauge network provided comprehensive coverage over the entire SPWA service area.

Further discussion and analysis of the wet weather flow and rainfall monitoring data is presented in the Flow Monitoring TM (No. 2d).

Table 1 – Temporary and Permanent Wet Weather Flow Monitors – Winter 2005

Number	Meter Type	Location	Pipe Diameter (in)
1	Temporary	Roseville	18
2	Temporary	Roseville	15
3	Temporary	Roseville	15
4	Temporary	Roseville	15
5	Temporary	Roseville	21
6	Temporary	Roseville	18
7	Temporary	Roseville	24
8	Temporary	Roseville	30
9	Temporary	Roseville	18
10	Temporary	Roseville	18
11	Temporary	Roseville	15
12	Temporary	Roseville	21
13	Temporary	Roseville	42
14	Temporary	Roseville	66
15	Temporary	Roseville	33
17	Temporary	Roseville	21
18	Temporary	Roseville	24
19	Temporary	Roseville	36
20	Temporary	Roseville	24
21	Temporary	Roseville	33
22	Temporary	Roseville	72
23	Temporary	Roseville	36
24	Temporary	Roseville	42
25	Temporary	Roseville	21
151	Temporary	SPMUD	20
152	Temporary	SPMUD	18
153	Temporary	SPMUD	18
154	Temporary	SPMUD	24
155	Temporary	SPMUD	21
156	Temporary	SPMUD	15
157	Temporary	SPMUD	18
158	Temporary	SPMUD	18
161	Temporary	Placer County	15
162	Temporary	Placer County	15
North Roseville	Permanent	SPMUD	36
Springview	Permanent	SPMUD	42
Strap Ravine	Permanent	Placer County	15
Old Auburn	Permanent	Placer County	18



Legend

- Flow Meter Location
- WWTP
- Collection System Pipe
- Flow Monitor Basin
- R — % of rainfall volume that enters system as RDI/I

FIGURE 4

Wet Weather Flow Monitor Basins with Calibration R Factors

November 2005

SOUTH PLACER WASTEWATER AUTHORITY

Regional Wastewater and Recycled Water Sewer Evaluation Project

N W E S

1 0.5 0 1

Scale in Miles

4 RDI/I Modeling with H_20MAP Sewer Pro

The hydraulic analysis of the SPWA collection system is being performed using H_2OMAP Sewer Pro, a commercially available modeling program. The program has several modules that can be used to simulate RDI/I. The modules are calibrated using flow monitor and precipitation data described above. Once the model is calibrated, a design storm is applied to develop design RDI/I flow projections. Design RDI/I and wet weather GWI are combined with design base flows to compute predicted design peak wet weather flows and identify collection system deficiencies.

RDI/I is modeled within H_2OMAP Sewer Pro using the modules to simulate storm water runoff. H_2OMAP Sewer Pro has a unit hydrograph module with four different unit hydrograph methods for projecting runoff. The tri-triangle method was utilized to simulate RDI/I because it is widely used for projecting RDI/I, it is very flexible and it can be readily used to simulate RDI/I. The module simulates how much of and how quickly RDI/I enters the collection system from the contributing basins and subbasins.

The parameters needed to simulate RDI/I with the tri-triangle module are illustrated in Figure 3. Up to three synthetic hydrographs and three corresponding sets of parameters are defined for each basin, representing the fast, medium, and slow response components of the total RDI/I hydrograph. Each synthetic hydrograph has an associated time to peak (T) and recession constant (K) that defines the shape of its respective hydrograph and a rainfall volume factor (R) percentage that determines the volume of RDI/I. These parameters are adjusted during wet weather calibration to vary how much and how quickly rainfall enters the collection system and how long it takes the flow to recede, until a reasonable match is obtained between the actual monitored wet weather hydrograph and the RDI/I projection. In some cases, only one or two synthetic hydrographs are needed to calibrate the RDI/I.

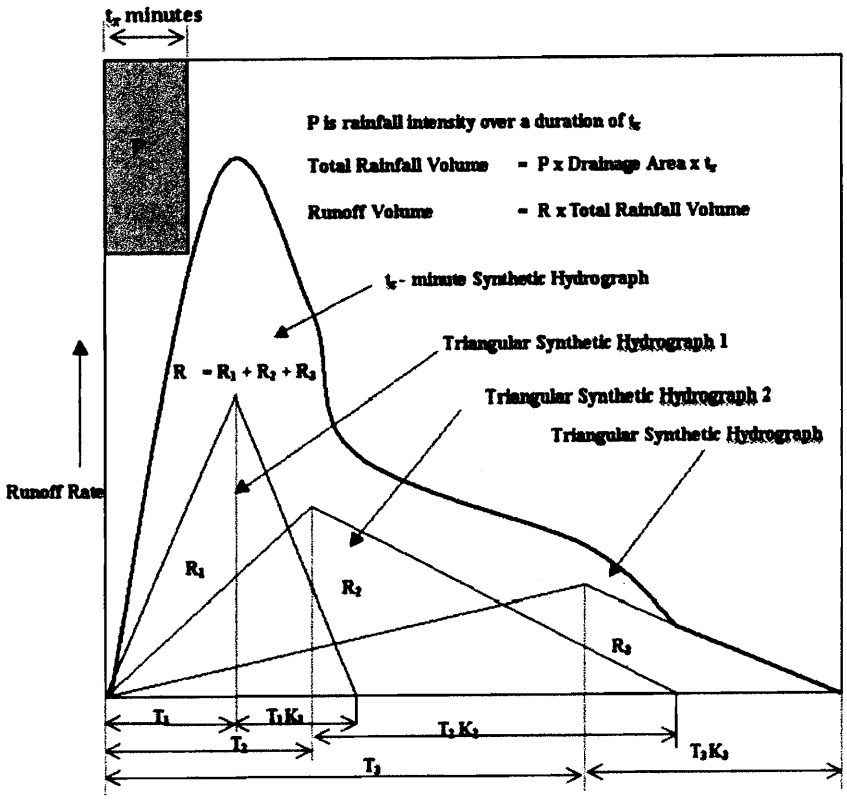


Figure 3 – Tri-Triangle Synthetic Hydrograph Method

5 RDI/I Calibration

RDI/I calibration was performed by adjusting the parameters in H_2OMAP Sewer Pro until the modeled flow at the wet weather flow monitor sites reasonably simulates flow monitor data for an actual storm event. Once the model is calibrated, the design storm rainfall profile can be applied to predict design RDI/I responses. A key assumption is that the design storm response will be similar to that of the calibrated storm event. Therefore it is important that the conditions of the calibration event (e.g., antecedent soil and groundwater conditions, magnitude and intensity of rainfall) be as close as possible to the desired design storm condition. The storm on March 1-2, 2005 was chosen as the calibration event because it was the largest storm during the flow monitoring period and there was a reasonable flow response at most of the flow monitoring locations.

The goal for calibration is to match the peak measured flow with the peak modeled flow and the general shape of the flow response (e.g., time to peak and duration and slope of hydrograph recession). However, as with any model, some flow monitor sites calibrate better than others. This was observed previously during the dry weather model calibration. For this model, calibration at critical locations on the trunk sewers entering Roseville from Placer County and SPMUD and trunk sewers within Roseville was successful. Flow data anomalies at some flow meter sites prevented better calibration at those locations.

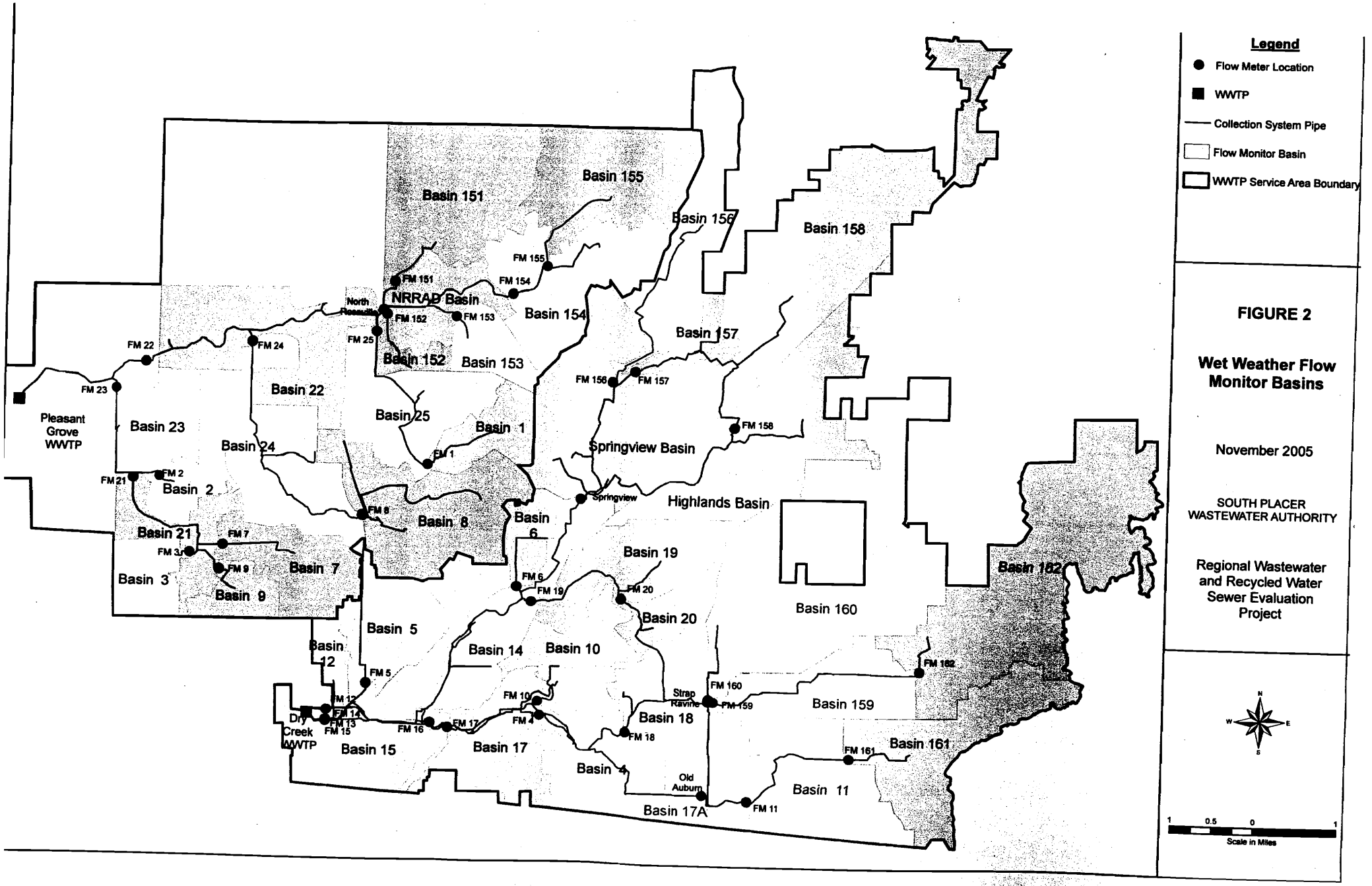
The calibration constants for the March 1-2 storm for each flow monitor basin are listed in Table 2. The plots of the model flow and flow monitor data are provided at the end of this TM in Attachment A. Figure 4 shows the wet weather flow monitor basins that were used to calibrate the model and their relative R factors.

Relatively low R factors ($\leq$ 1.5%) generally indicate a "tight" system with low rates of RDI/I. Some of the higher R factors ($\geq$ 3%) were found in the older areas of Roseville where pipes and laterals may have a higher level of deterioration, thus allowing more I/I into the system.

Table 2 – RDI/I Calibration Parameters for March 1-2, 2005 Storm Event

Flow Monitor Basin	Total R[a] (%)	Hydrograph 1[b]			Hydrograph 2[b]			Hydrograph 3[b]		
		R_1 (% of R)	T_1	K_1	R_2 (% of R)	T_2	K_2	R_3 (% of R)	T_3	K_3
1	0.5	60	1	2	40	8	3	0	24	2
2	0.5	60	2	0.5	40	6	3	0	24	2
3	1.0	75	1	1	25	8	3	0	24	2
4	1.0	60	1.5	1	40	8	3	0	24	2
5	3.5	65	2	2	35	6	3	0	24	2
6	0.5	60	1	2	40	8	3	0	24	2
7	3.0	70	1.5	1	30	6	3	0	24	2
8	1.0	50	2	0.75	50	8	3	0	24	2
9	0.75	75	1	1	25	8	3	0	24	2
10	0.75	70	2	1	30	8	3	0	24	2
11[d]	1.0	30	1	2	60	8	3	10	24	0.5
12	3.0	65	2	2	35	6	3	0	24	2
14	1.5	80	2	2	20	8	3	0	24	2
15N	3.0	65	2	2	35	6	3	0	24	2
15S	1.0	65	2	1	35	6	3	0	24	2
17/17A[c]	1.0	70	2	1	30	6	3	0	24	2
18	1.0	80	2	2	20	8	3	0	24	2
19	1.0	80	2	2	20	8	3	0	24	2
20	1.0	80	2	2	20	8	3	0	24	2
21	0.5	60	2	0.5	40	6	3	0	24	2
22	0.5	75	2	2	25	8	3	0	24	2
23	0.5	65	2	0.5	35	6	3	0	24	2
24	0.75	75	5.5	2	25	8	3	0	24	2
25	0.5	50	1	2	50	8	3	0	24	2
151	0.2	0	1	0.5	100	6	0.5	0	24	2
152	0.1	5	1	2	70	8	1	25	24	2
153	2.75	0	0.5	0.5	50	8	0.5	50	24	0.5
154	2.25	10	1	2	10	8	1	80	24	1
155	3.0	10	0.5	2	90	8	3	0	24	2
156	0.5	40	2	2	40	8	3	20	24	2
157	5.0	0	1	0.5	80	6	0	20	24	2
158	0.5	40	2	2	40	8	3	20	24	2
161	1.5	7	1	2	50	7	1	43	24	0.5
162	0.5	20	2	2	40	8	3	40	24	2
North Roseville	0.1	0	0.5	1	80	6	0.5	20	24	2
Springview	2.0	5	2	2	30	8	3	65	24	2
Strap Ravine[e]	0.5	40	1	1	45	8	1	15	24	2

[a] Total percent of rainfall volume that enters the collection system as RDI/I
[b] Refer to Figure 3 for R, T, and K coefficient definitions. R_1, R_2, and R_3 are a percentage of Total R (total 100%)
[c] Flow from Monitor Basin 17A flows through the area representing Basin 4 but is tributary to flow monitor 17.
d Data from Flow Monitor Basin 11 represents the majority of the area tributary to the Old Auburn flow monitor.
e Data from the Strap Ravine Flow Monitor Basin represents the area tributary to the flow monitors 159 and 160.


Legend
Flow Meter Location
WWTP
Collection System Pipe
Flow Monitor Basin
WWTP Service Area Boundary
FIGURE 2
Wet Weather Flow Monitor Basins
November 2005
SOUTH PLACER WASTEWATER AUTHORITY
Regional Wastewater and Recycled Water Sewer Evaluation Project
Basin 151
Basin 155
Basin 156
Basin 158
NRRAD Basin
North Roseville
Basin 154
Basin 157
Basin 152
Basin 153
Basin 22
Basin 25
Basin 1
Basin 23
Basin 24
Pleasant Grove WWTP
Springview Basin
Springview
Highlands Basin
Basin 2
Basin 8
Basin 6
Basin 21
Basin 19
Basin 162
Basin 7
Basin 3
Basin 9
Basin 160
Basin 20
Basin 5
Basin 12
Basin 14
Basin 10
Basin 159
Basin 18
Basin 15
Basin 17
Basin 4
Basin 161
Basin 11
Basin 17A
Dry Creek WWTP
Strap Ravine
Old Auburn
FM 151
FM 152
FM 153
FM 154
FM 155
FM 156
FM 157
FM 158
FM 159
FM 160
FM 161
FM 162
FM 1
FM 2
FM 3
FM 4
FM 5
FM 6
FM 7
FM 8
FM 9
FM 10
FM 11
FM 12
FM 13
FM 14
FM 15
FM 16
FM 17
FM 18
FM 19
FM 20
FM 21
FM 22
FM 23
FM 24
FM 25
N
S
E
W
1
0.5
0
1
Scale in Miles

6 Wet Season GWI

Wet season GWI occurs in addition to the dry season GWI that was defined in the Dry Weather Flow Projection TM (No. 2a). Wet season GWI was determined by comparing average daily flows at the permanent flow monitor sites in Roseville, SPMUD and Placer County during the 2004 dry season and 2005 wet season. Wet weather GWI was calculated for each area tributary to the permanent flow monitoring sites and was applied to each parcel in the model according the area of the parcel. Wet weather GWI is summarized in Tables 3 and 4. Based on the results of this analysis, a wet season GWI rate of 200 gpd/acre was applied to currently developed parcels in the Dry Creek watershed. A wet season GWI rate of 100 gpd/acre was applied to currently developed parcels in the Pleasant Grove watershed. Wet season GWI was not applied to parks, open space, or Union Pacific Railroad property.

Table 3 - Estimated Wet Season GWI in the Dry Creek Watershed

Permanent Monitor Location	Tributary Area (acres)	2005 Wet Season ADWF (mgd)	2004 Dry Season ADWF (mgd)	Wet Season GWI (mgd)	Wet Season GWI Rate (gpd/acre)
Roseville[a]	5,076	6.32	5.09	1.23	242
SPMUD (Springview)	3,791	3.65	2.99	0.66	174
Placer County (Strap Ravine)	2,533	1.47	1.03	0.44	174
Placer County (Old Auburn)	1,555	1.46	1.25	0.21	135
Dry Creek WWTP	**12,955**	**12.90**	**10.36[b]**	**2.54**	**196**

[a] Calculated flow rates. Includes the following areas outside of Roseville: Highlands and West Dry Creek
[b] 2004 dry season ADWF estimated based on 2005 dry season ADWF data at Dry Creek and Pleasant Grove WWTP

Table 4 - Estimated Wet Season GWI in the Pleasant Grove Watershed

Permanent Monitor Location	Tributary Area (acres)	2005 Wet Season ADWF (mgd)	2004 Dry Season ADWF (mgd)	Wet Season GWI (mgd)	Wet Season GWI Rate (gpd/acre)
Roseville[a]	4,064	5.27	4.79	0.48	118
SPMUD (North Roseville)	1,841	1.96	1.84	0.12	65
Pleasant Grove WWTP	**5,905**	**7.23**	**6.63[b]**	**0.60**	**102**

[a] Calculated flow rates. Includes the following areas outside of Roseville: Sunset Industrial Park
[b] 2004 dry season ADWF estimated based on 2005 dry season ADWF data at Dry Creek and Pleasant Grove WWTP

7 RDI/I Projections

The hydraulic model was run to simulate the March 1-2, 2005 storm using the calibrated RDI/I parameters and GWI. The peak flows from the model runs at key flow monitoring locations on the trunk sewers are listed in Table 5. The peak hour model results matched the flow data relatively well at the key flow monitoring sites in the system. Some of the other monitoring sites did not calibrate as well, particularly the sites where the dry weather calibration did not match the monitored flows. The model results at the Dry Creek WWTP calibration point was approximately 15 percent low. The model results at the Pleasant Grove WWTP calibration point was approximately 24 percent high. This may be explained by the metering at each WWTP. According to the City of Roseville, there have been some flow monitor problems at the Dry Creek WWTP for some time. The City has developed some average daily flow adjustment factors that are applied to the monitor data. It is not clear if these adjustment factors are as accurate when applied to hourly flow data. Flows at the Pleasant Grove WWTP monitor are limited (flow backs up in the collection system) by the influent pump station capacity of approximately 9 mgd.A typical diurnal pattern shape would normally peak very close to the modeled flow. This case is presented in the calibration hydrographs in Attachment A.

Table 5 – Peak Wet Weather Flow at Key Flow Monitoring Sites for March 1-2, 2005 Storm Event

Monitor Location	Peak Hour Monitor Flow (mgd)	Peak Hour Model Flow (mgd)
Dry Creek Watershed		
Dry Creek WWTP	21.10	17.89
13	6.88	7.11
14	7.98	7.82
15	3.43	3.10
Old Auburn	2.85	2.99
Strap Ravine	2.31	2.41
Springview	6.08	6.00
Pleasant Grove Watershed		
Pleasant Grove WWTP	9.19	11.38
22	6.27	8.21
23	3.57	3.50
24	2.43	3.31
25	1.60	1.13
North Roseville	3.76	3.98
154	1.75	1.72

8 Future RDI/I

In order to project flows from future development, reasonable assumptions for future I/I were made based on trends in the existing system. I/I from future development may not appear immediately, but most likely will occur over time as the system deteriorates. I/I from future development was projected in the model by applying the following I/I parameters to the future development parcels. These rates coincide with I/I rates in some of the newer developed areas within the SPWA service area.

- Urban Growth Areas and West Roseville: R_t = 0.5% distributed evenly between R_1 and R_2 (T_1=2, K_1=2, T_2=8, K_2=3) and 100 gpad wet season GWI.
- Infill Development: Utilize the same RDI/I parameters and GWI rate as surrounding developed areas (GWI: 100 gpad in PG basin, 200 gpad in DC basin).
- RDI/I and wet season GWI are not applied to future parks or open space.
- Due to the extremely low development density in the Placer UGA (10 acres/du), RDI/I and wet season GWI were only applied to 1 acre per developed parcel.

9 Design Storm

RDI/I flows are dependent on several factors including rainfall amount. RDI/I flows are typically projected using a design storm event. For this project, a 10-year, 24-hour design storm was chosen to project peak wet weather flows in the model. This is the design condition adopted by Sacramento County and recently required by the Central Valley Regional Water Quality Control Board in an order to the City of Folsom. The design storm hyetograph was developed utilizing Table 5-A-1 (elevation (h) = 150 feet) from the Placer County Flood Control and Water Conservation District Stormwater Management Manual (September 1, 1990). The peak rainfall hour was set at 6 a.m. so that the peak RDI/I response (which would normally occur about 1-2 hours after the rainfall for a typical basin) roughly coincides with the peak hour of the dry weather profiles to give a conservative flow response in the collection system. The 24-hour rainfall and peak intensity for the 10-year design storm are listed in Table 6. The design storm hyetograph is shown in Figure 5.

Table 6 – Design Storm Volumes

Design Storm Recurrence Frequency	24-hour Rainfall Volume (inches)	Peak 6-hour Rainfall Volume (inches)	Peak 1-hour Rainfall Volume (inches)
10-year	2.97	1.65	0.77

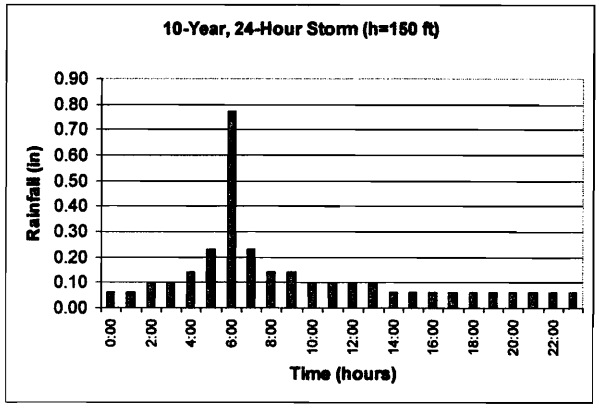


Figure 5 – Design Storm Hyetograph

10 Wet Weather Flow Projection

The hydraulic model was used to project current and buildout wet weather flows under 10-year design storm conditions using the calibration and future RDI/I parameters and GWI values previously presented. The design storm peak wet weather flows at the key monitor locations are listed for current and buildout conditions in Table 7. Design flow hydrographs for buildout conditions at Dry Creek and Pleasant Grove WWTPs are shown in Figure 6 and Figure 7. Based on these projections, the ratios of peak hour wet weather flow to average dry weather flow for the Dry Creek and Pleasant Grove WWTPs at buildout are approximately 3.0 and 2.1, respectively.

Table 7 – 10-Year Design Storm Peak Wet Weather Flow for Current and Buildout Conditions

Monitor Location	Current Average Daily Flow (mgd)	Buildout Average Daily Flow (mgd)	Current Peak Hour Flow (mgd)	Buildout Peak Hour Flow (mgd)
Dry Creek Watershed				
Dry Creek WWTP	9.34	19.3	27.8	57.7
13			10.4	12.2
14			10.9	25.3
15			6.5	8.6
Old Auburn			3.4	3.4
Strap Ravine			3.0	8.1
Springview			7.1	14.7
Pleasant Grove Watershed				
Pleasant Grove WWTP	7.33	23.4	17.4	48.1
22			11.2	25.3
23			7.3	7.7
24			4.6	7.8
25			1.6	2.3
North Roseville			4.7	9.1
154			2.5	3.9

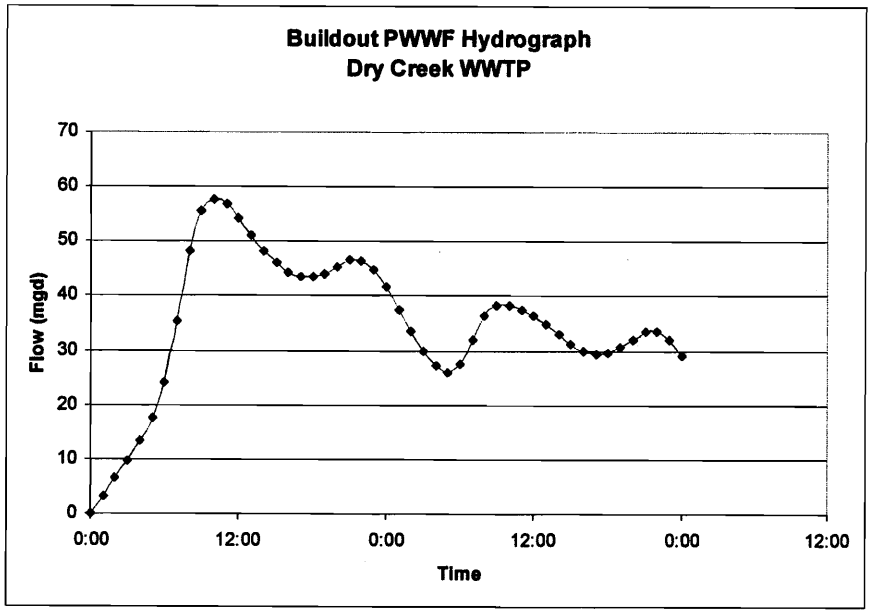


Figure 6 – Dry Creek WWTP – Design Flow Hydrograph

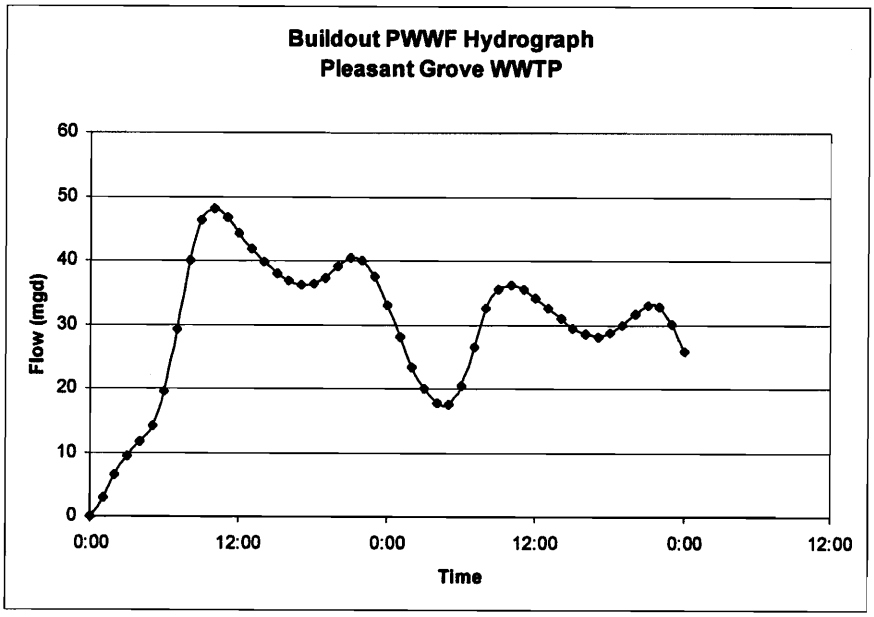
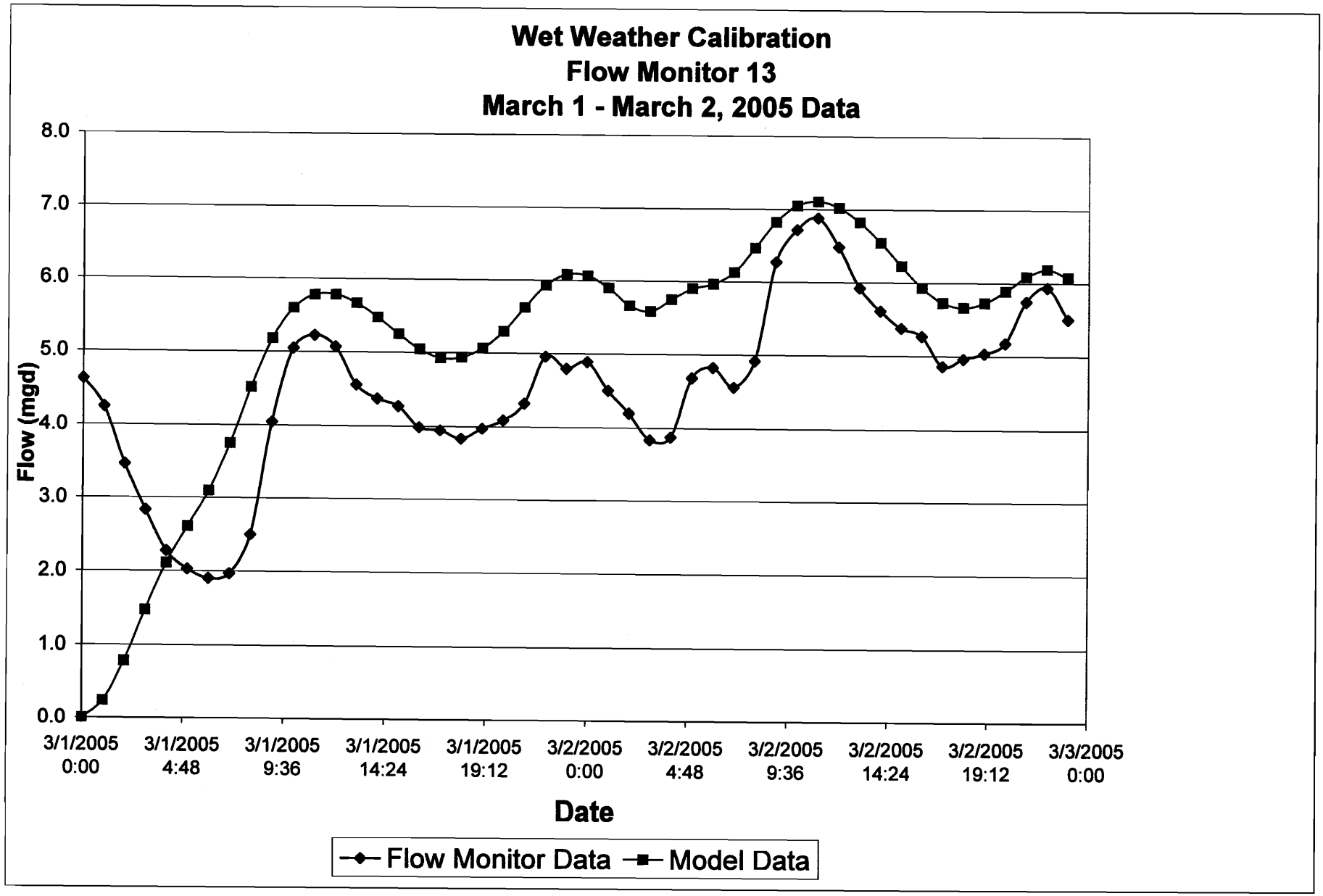
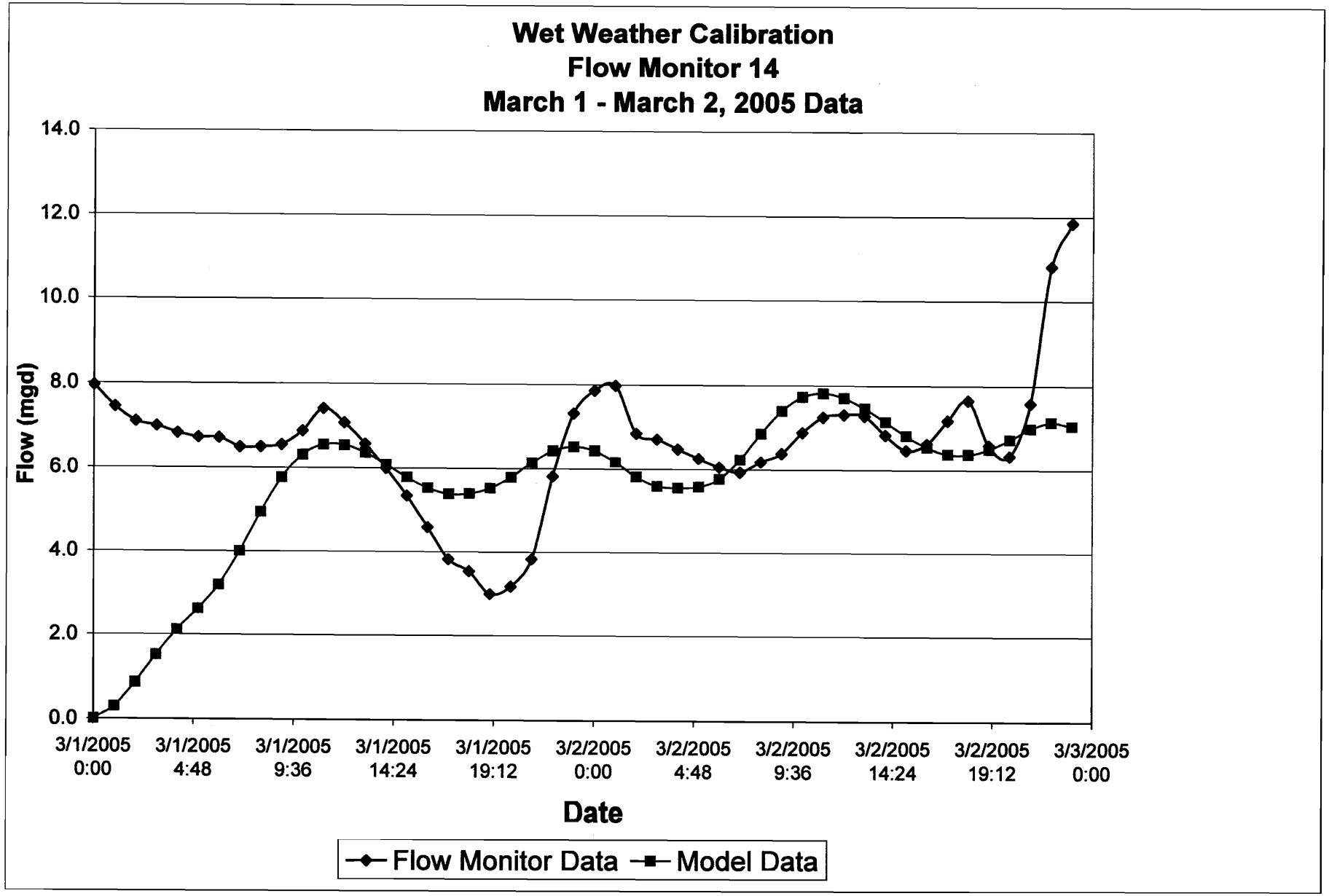


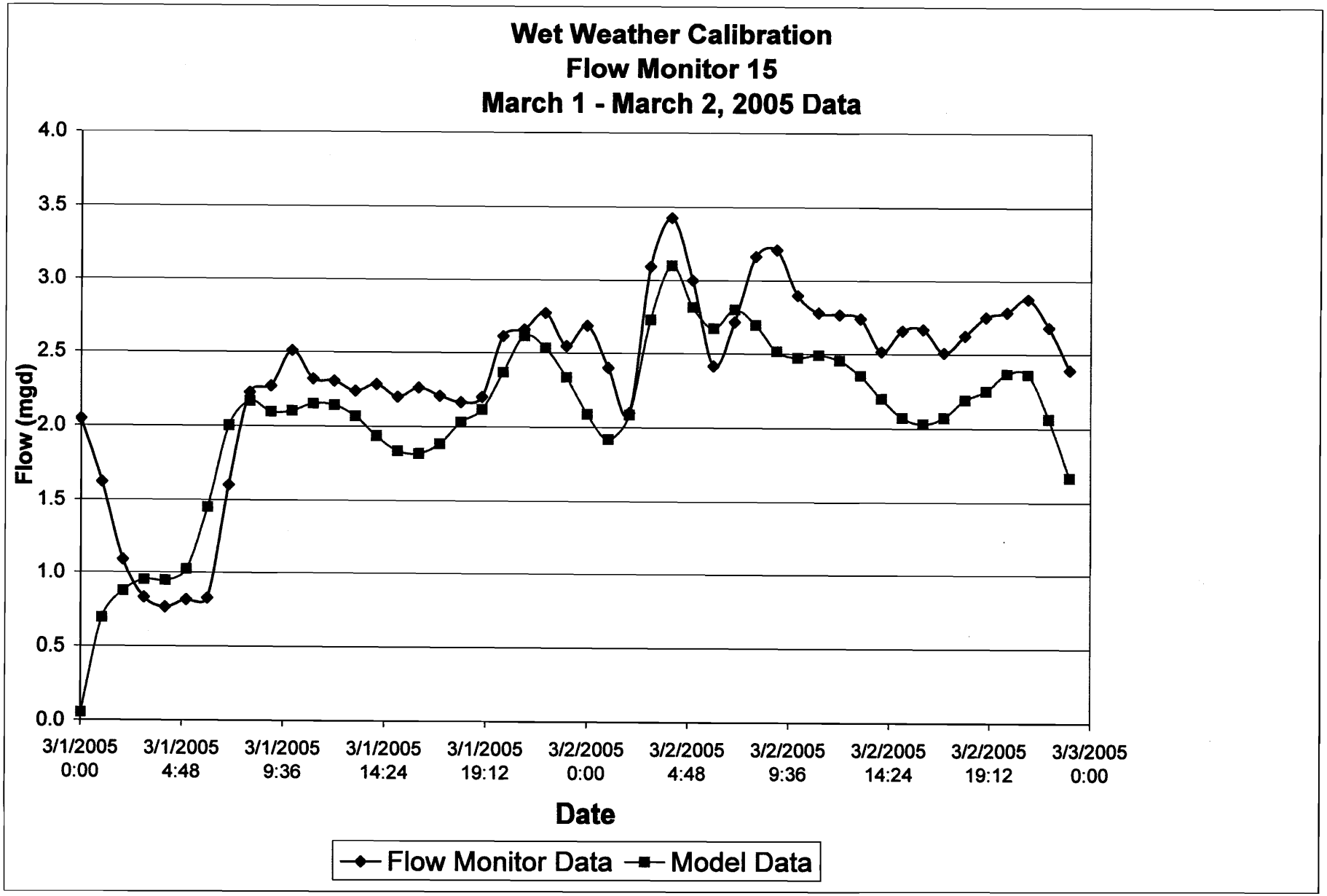
Figure 7 – Pleasant Grove WWTP – Design Flow Hydrograph

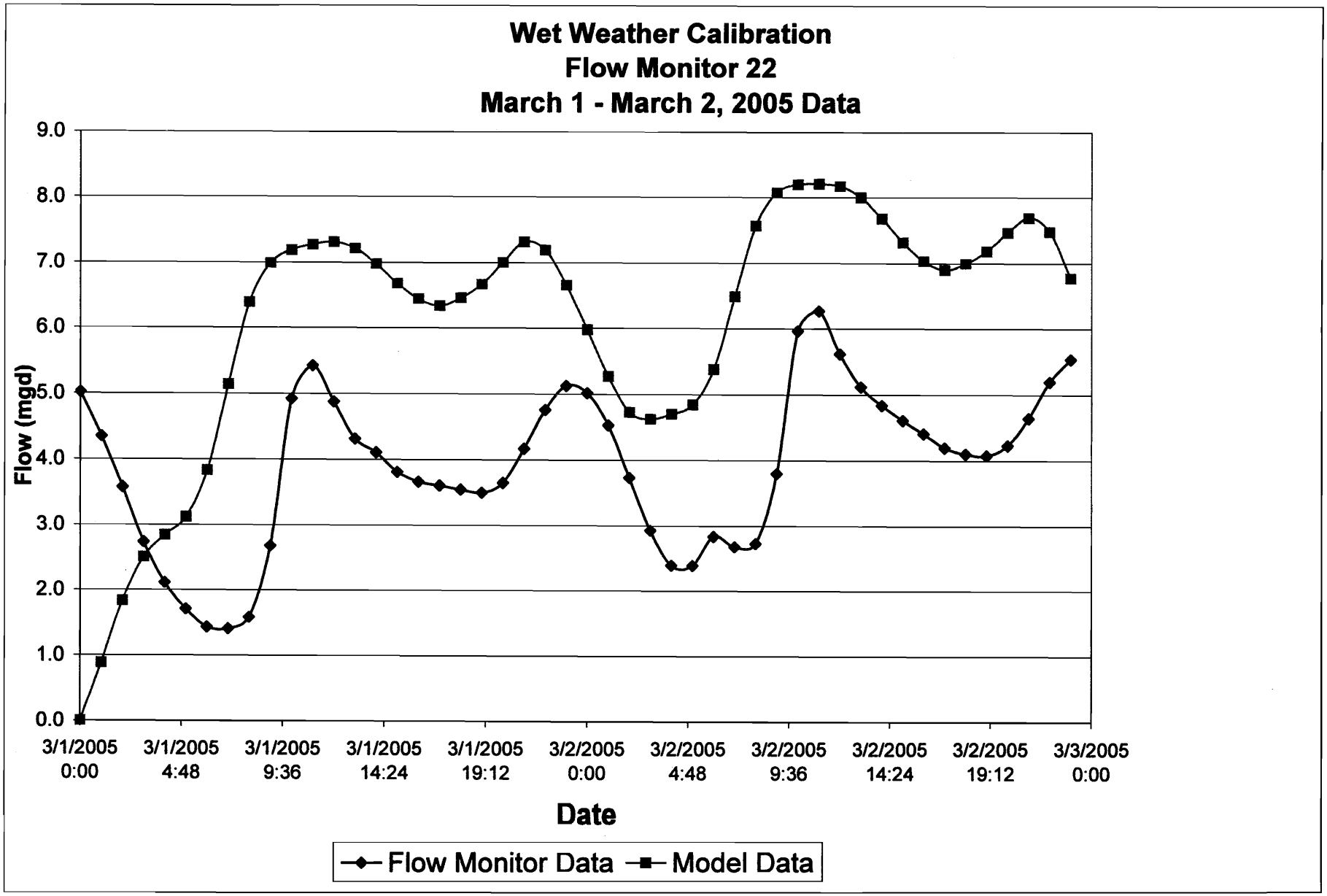
Attachment A

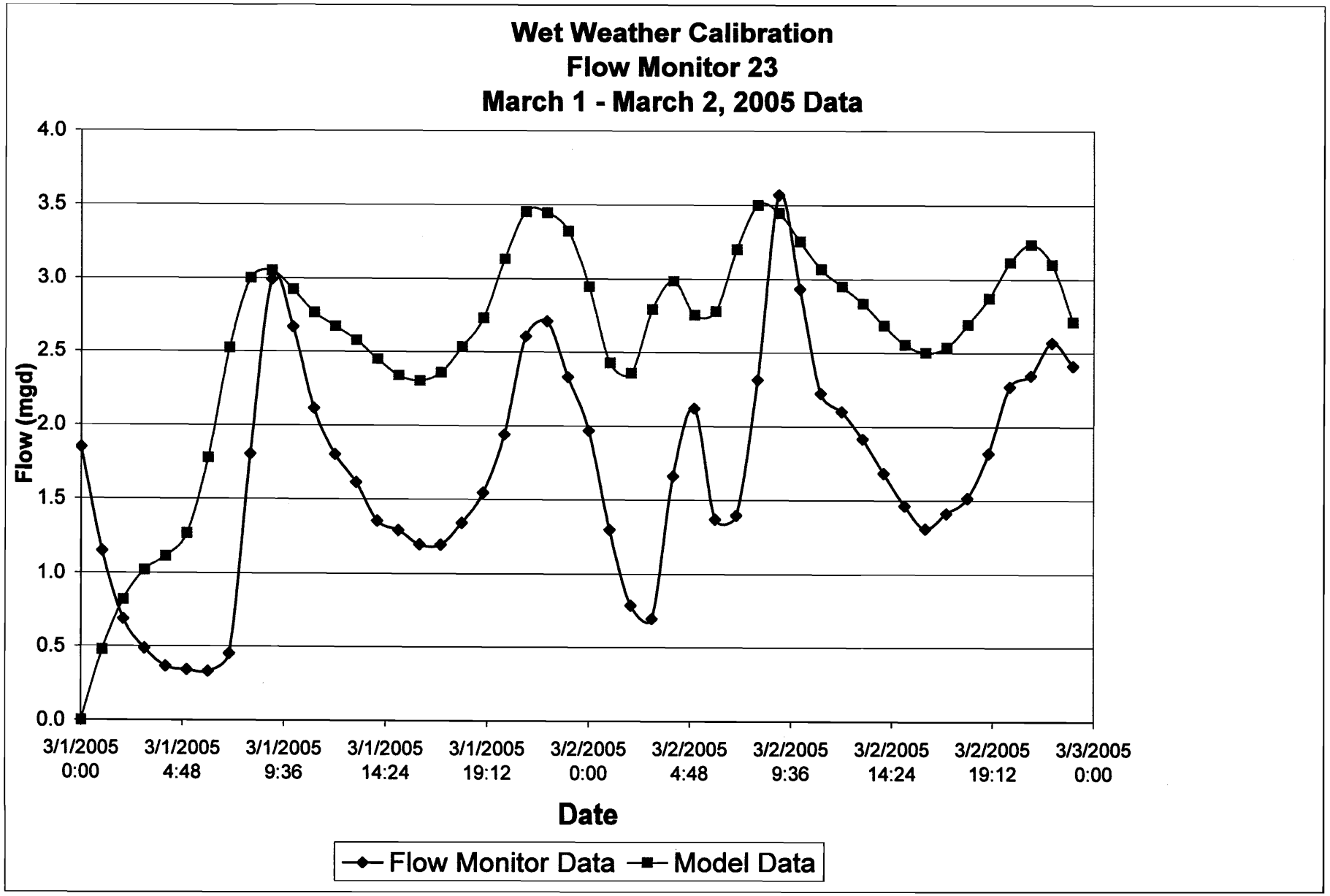
Model Calibration Hydrographs

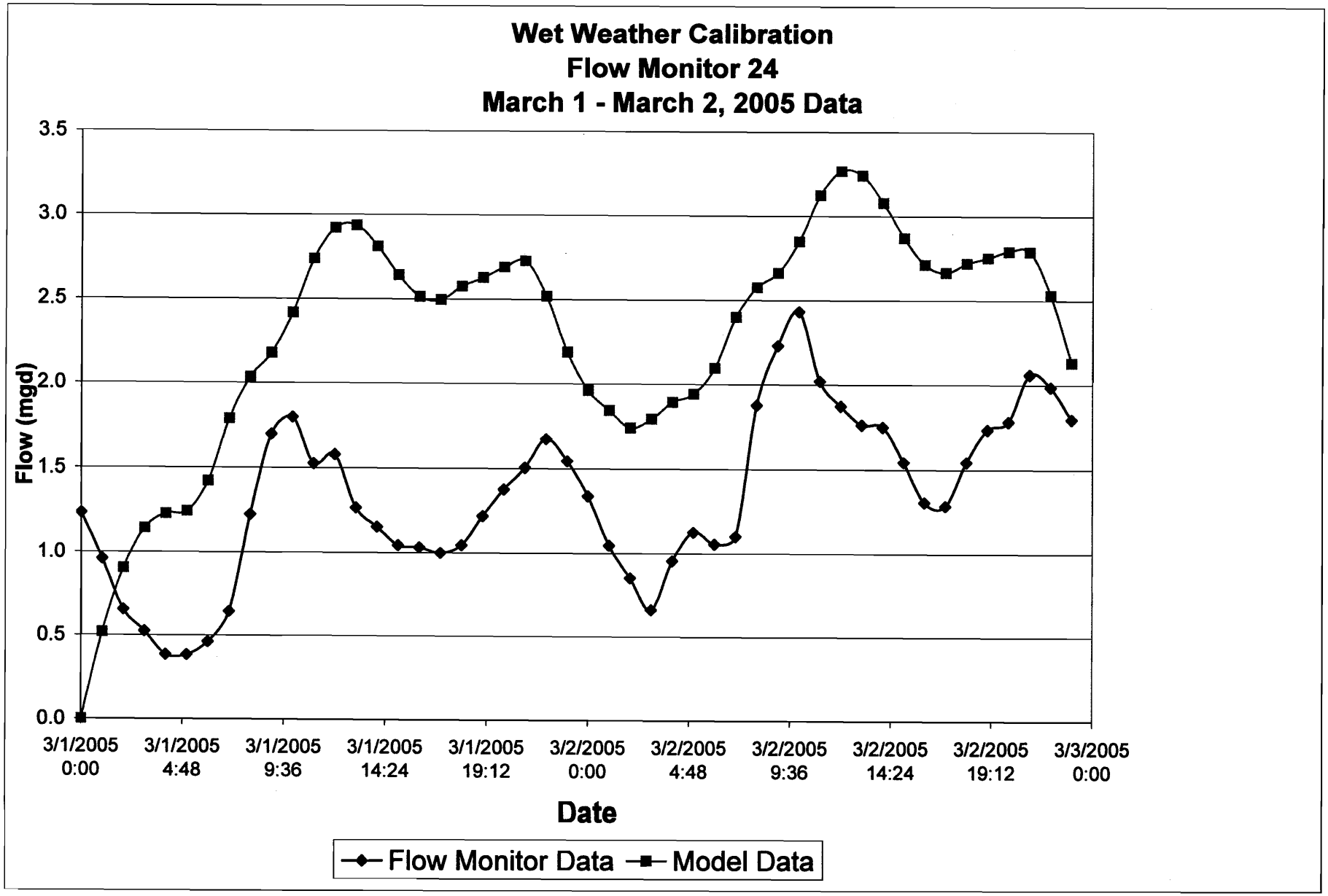

Wet Weather Calibration
Flow Monitor 13
March 1 - March 2, 2005 Data
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Flow (mgd)
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

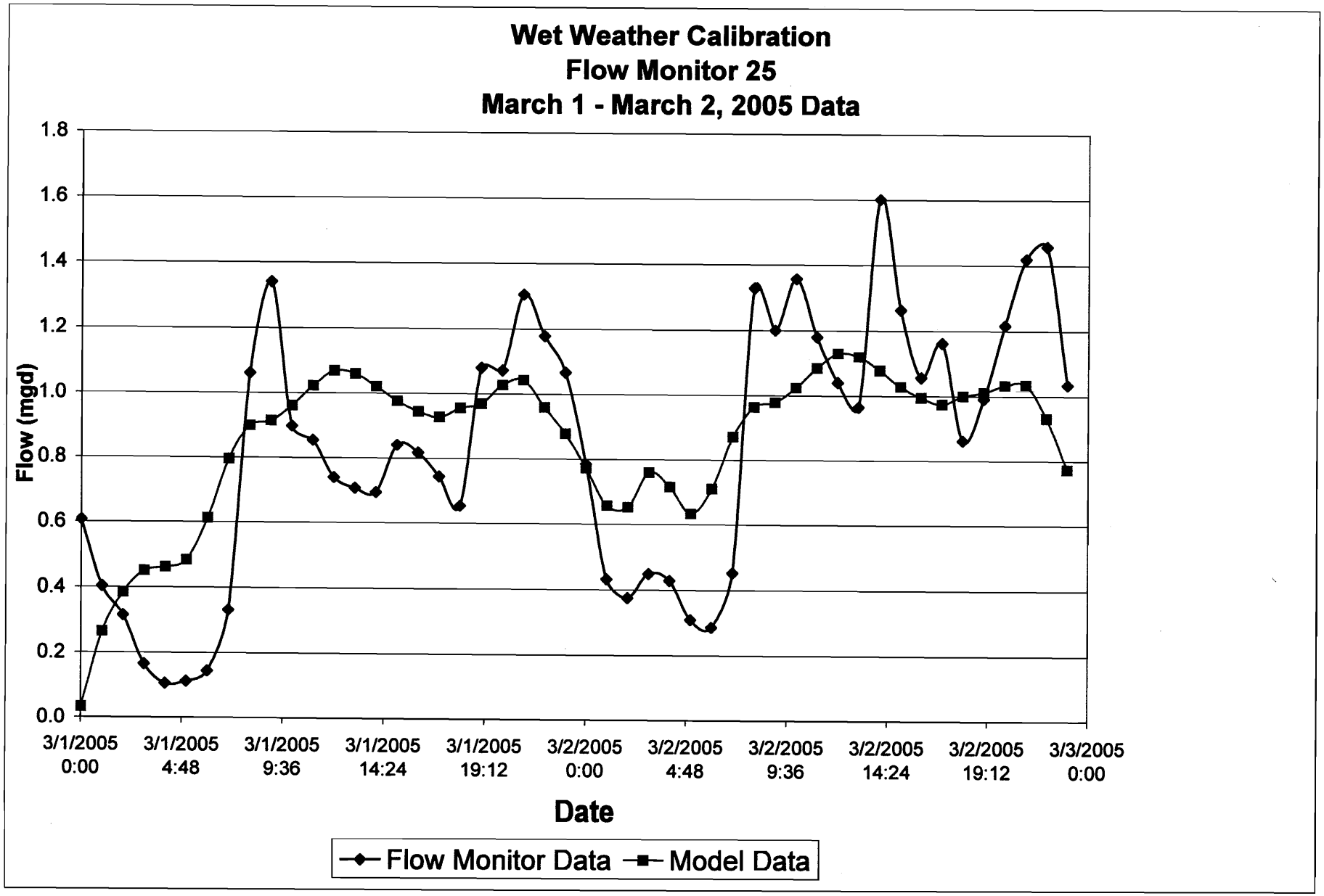

Wet Weather Calibration
Flow Monitor 14
March 1 - March 2, 2005 Data
Flow (mgd)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

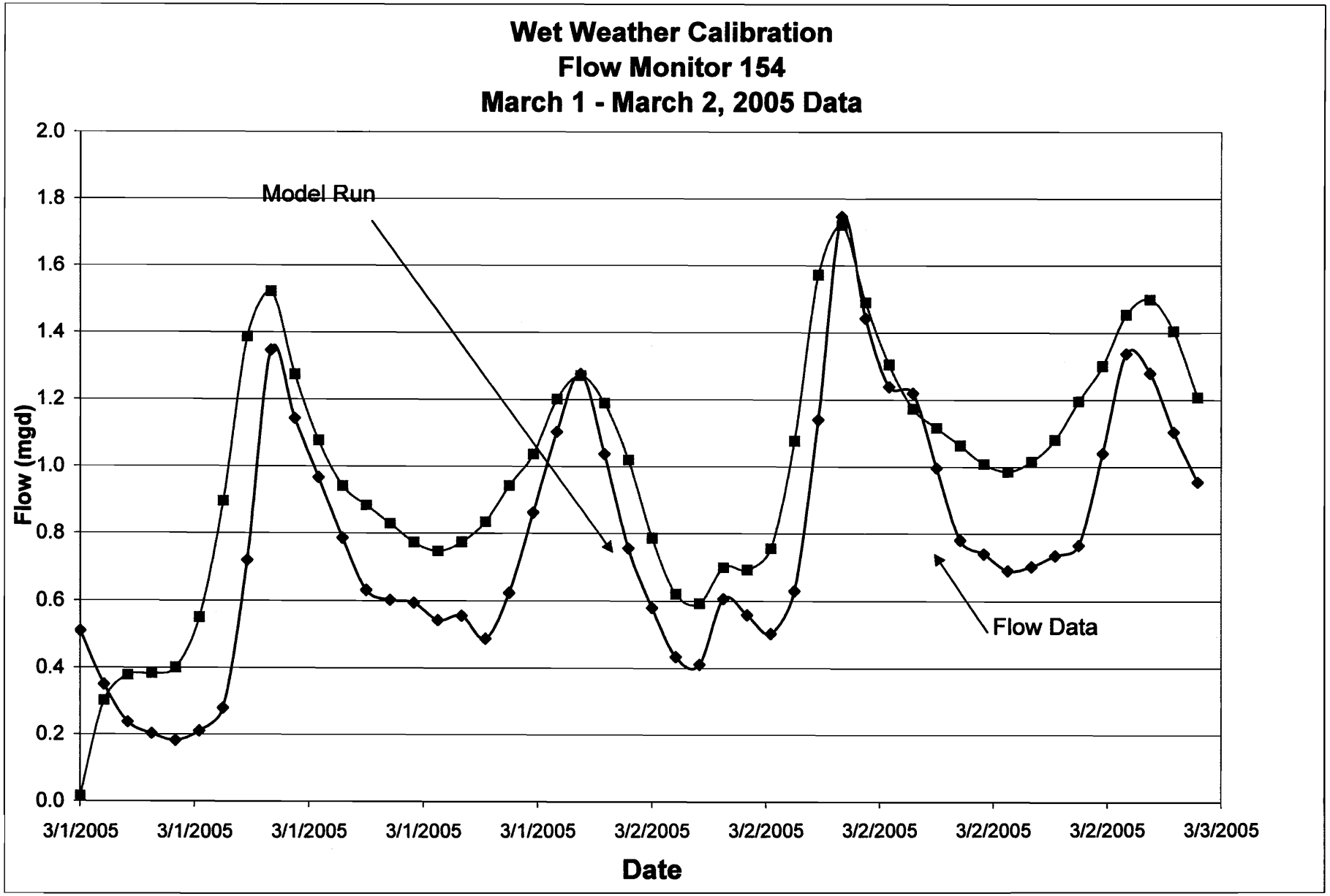

Wet Weather Calibration
Flow Monitor 15
March 1 - March 2, 2005 Data
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

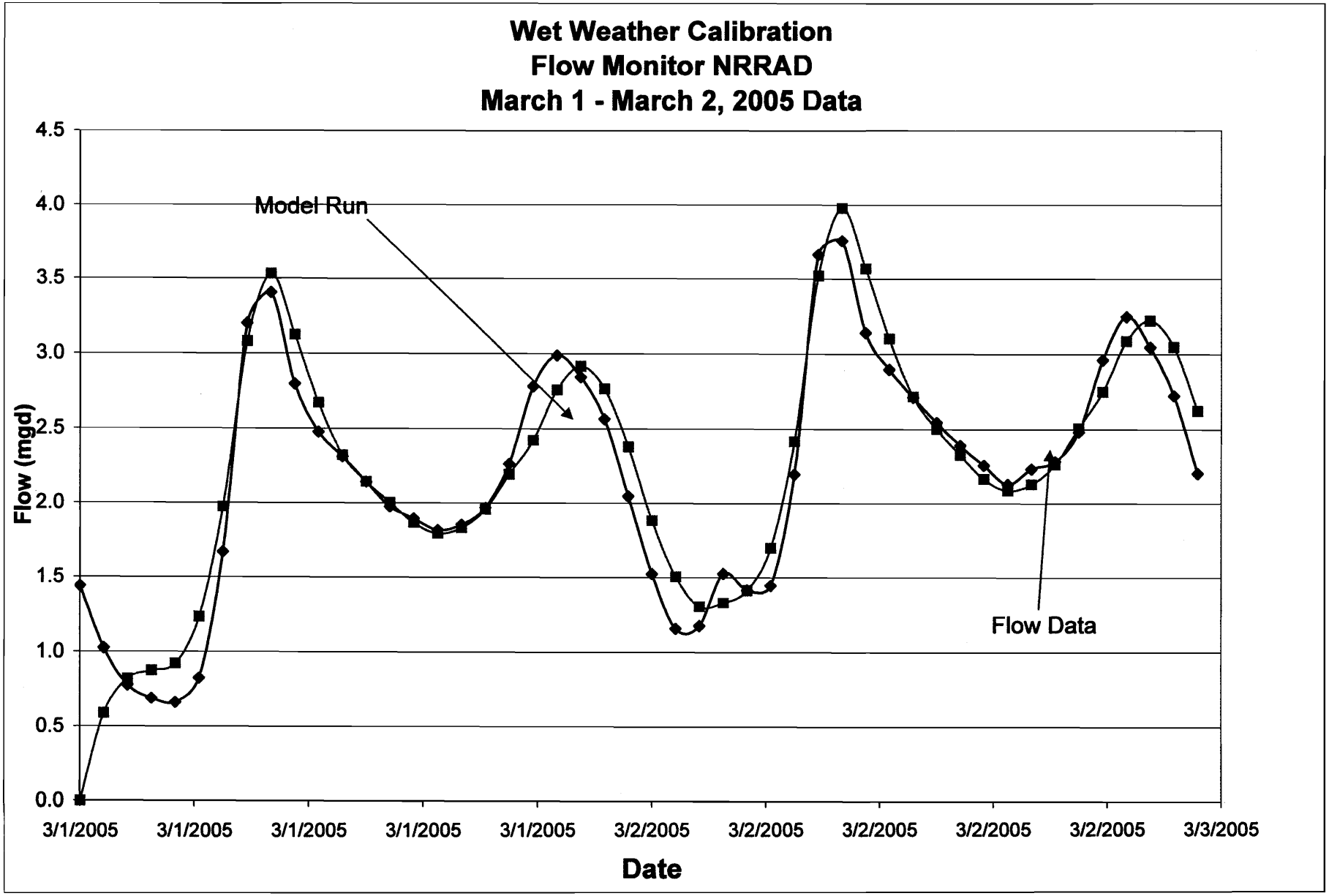

Wet Weather Calibration
Flow Monitor 22
March 1 - March 2, 2005 Data
Flow (mgd)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

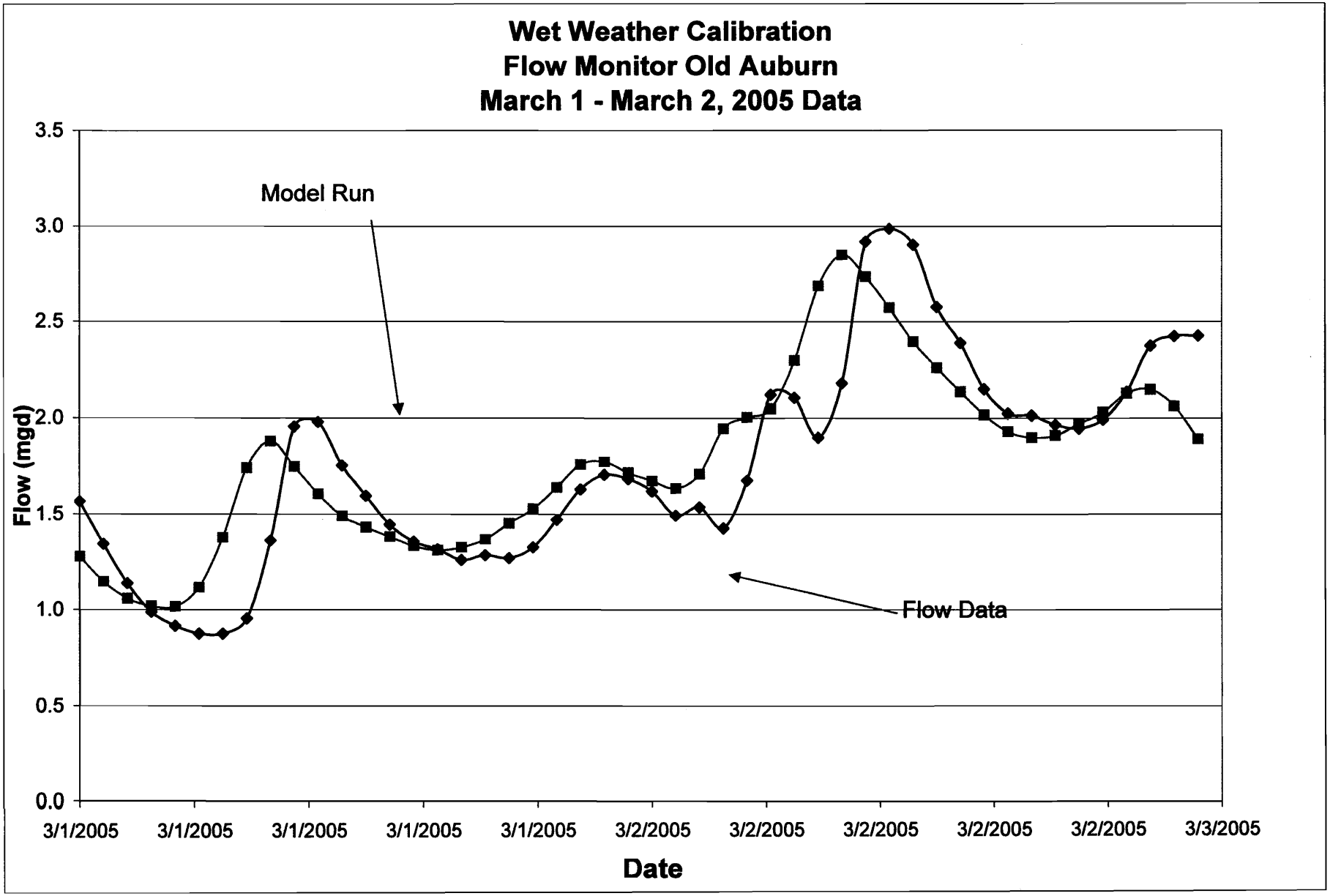

Wet Weather Calibration
Flow Monitor 23
March 1 - March 2, 2005 Data
Flow (mgd)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

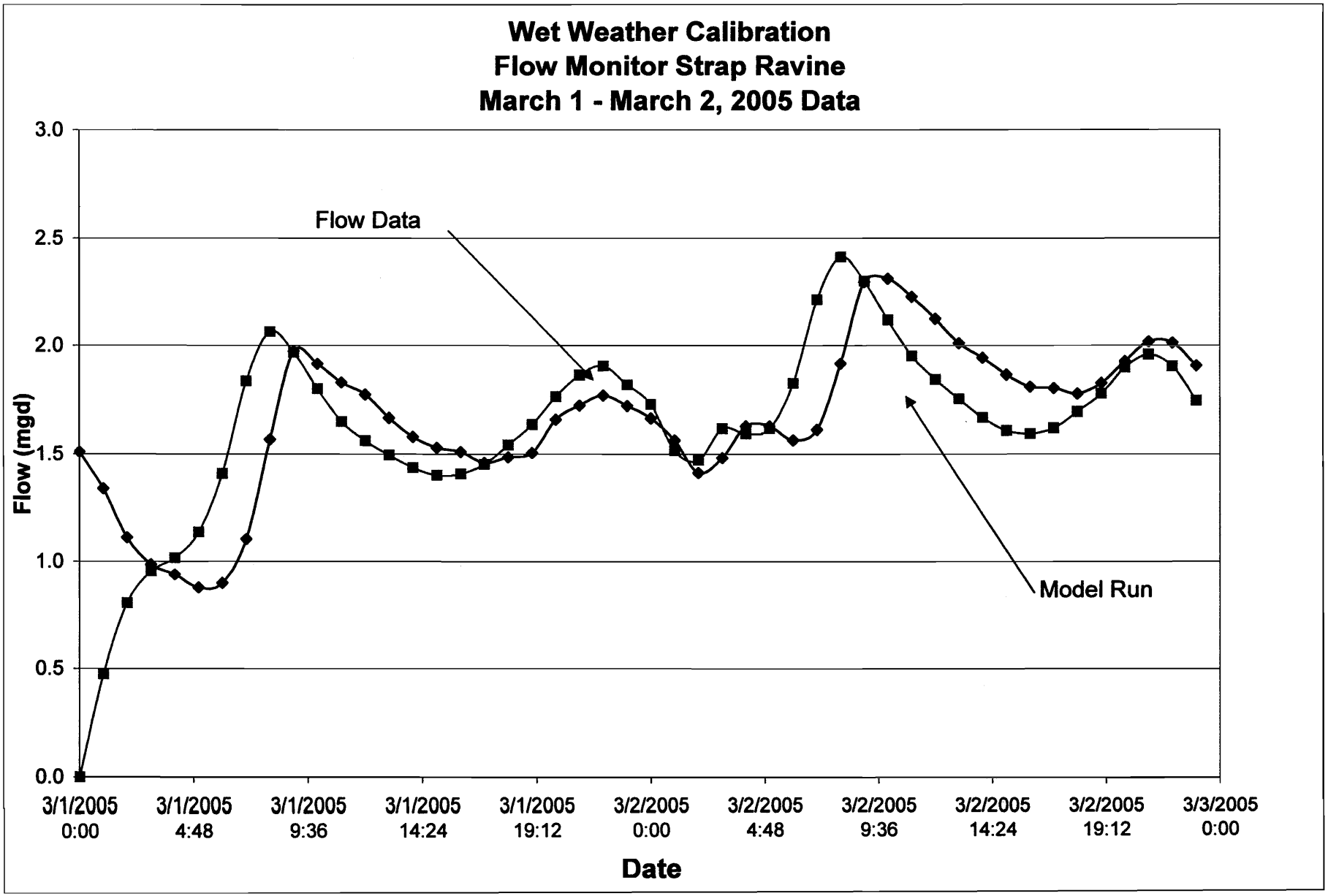

Wet Weather Calibration
Flow Monitor 24
March 1 - March 2, 2005 Data
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

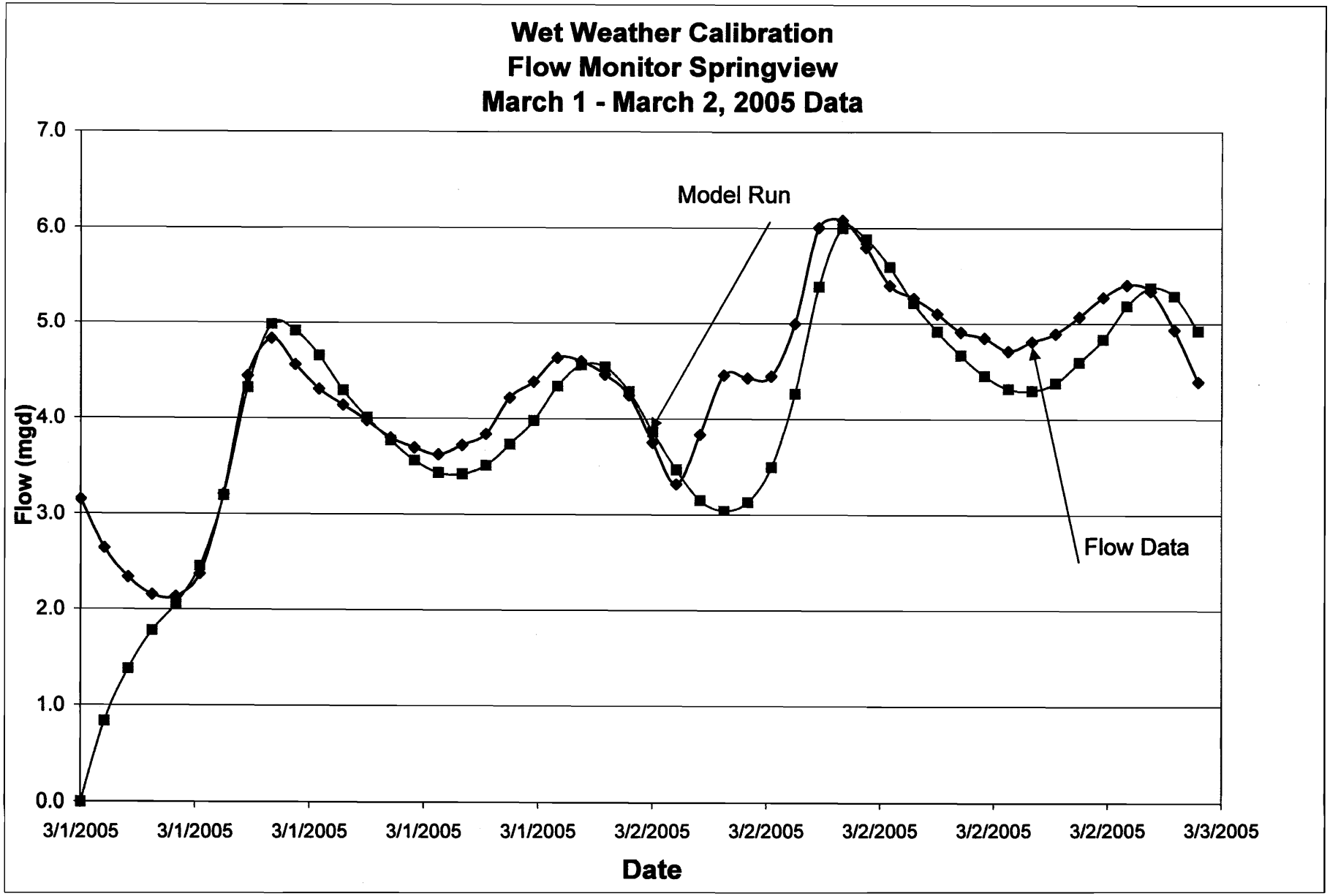

Wet Weather Calibration
Flow Monitor 25
March 1 - March 2, 2005 Data
Flow (mgd)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data

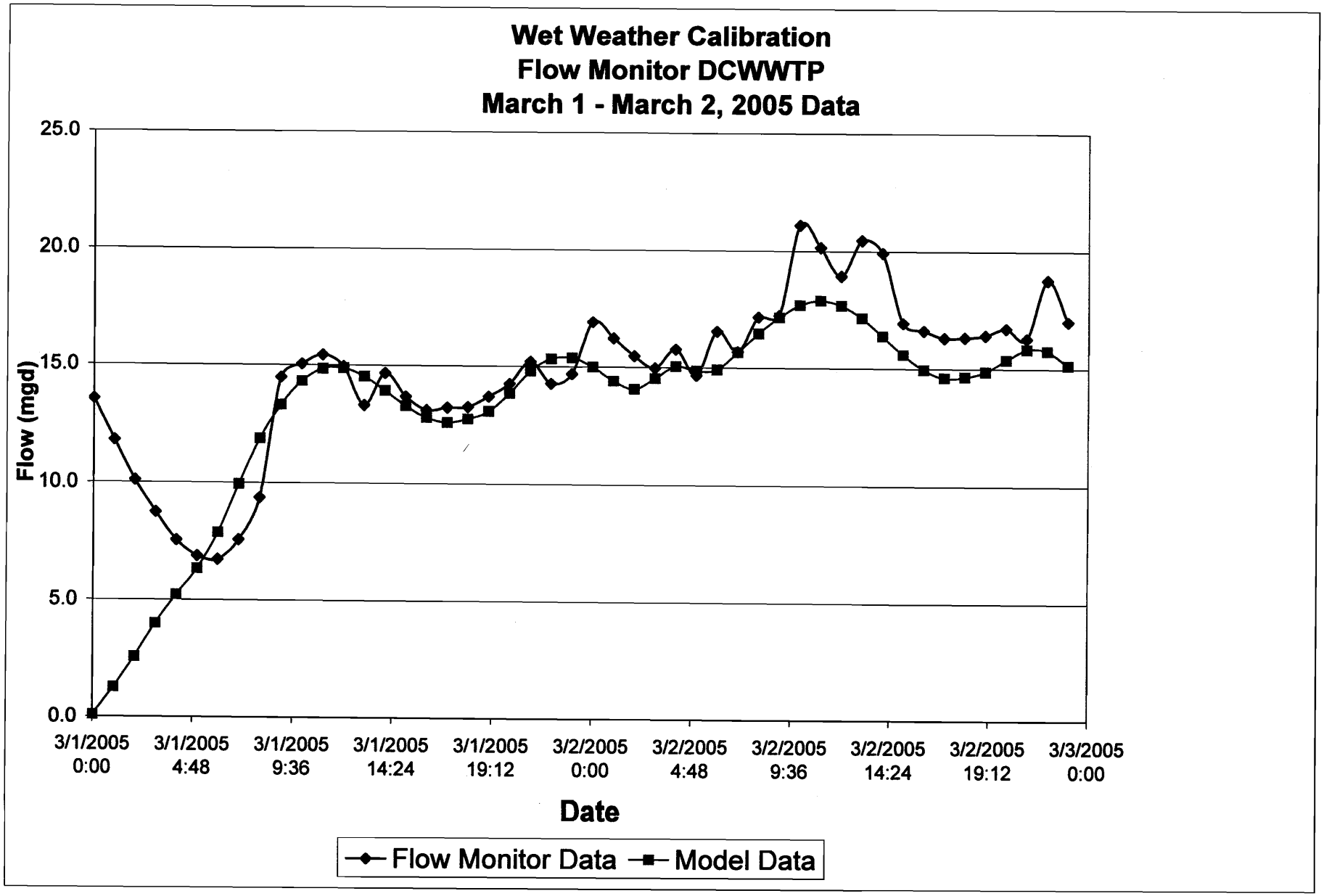

Wet Weather Calibration
Flow Monitor 154
March 1 - March 2, 2005 Data
Model Run
Flow Data
Flow (mgd)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/3/2005
Date

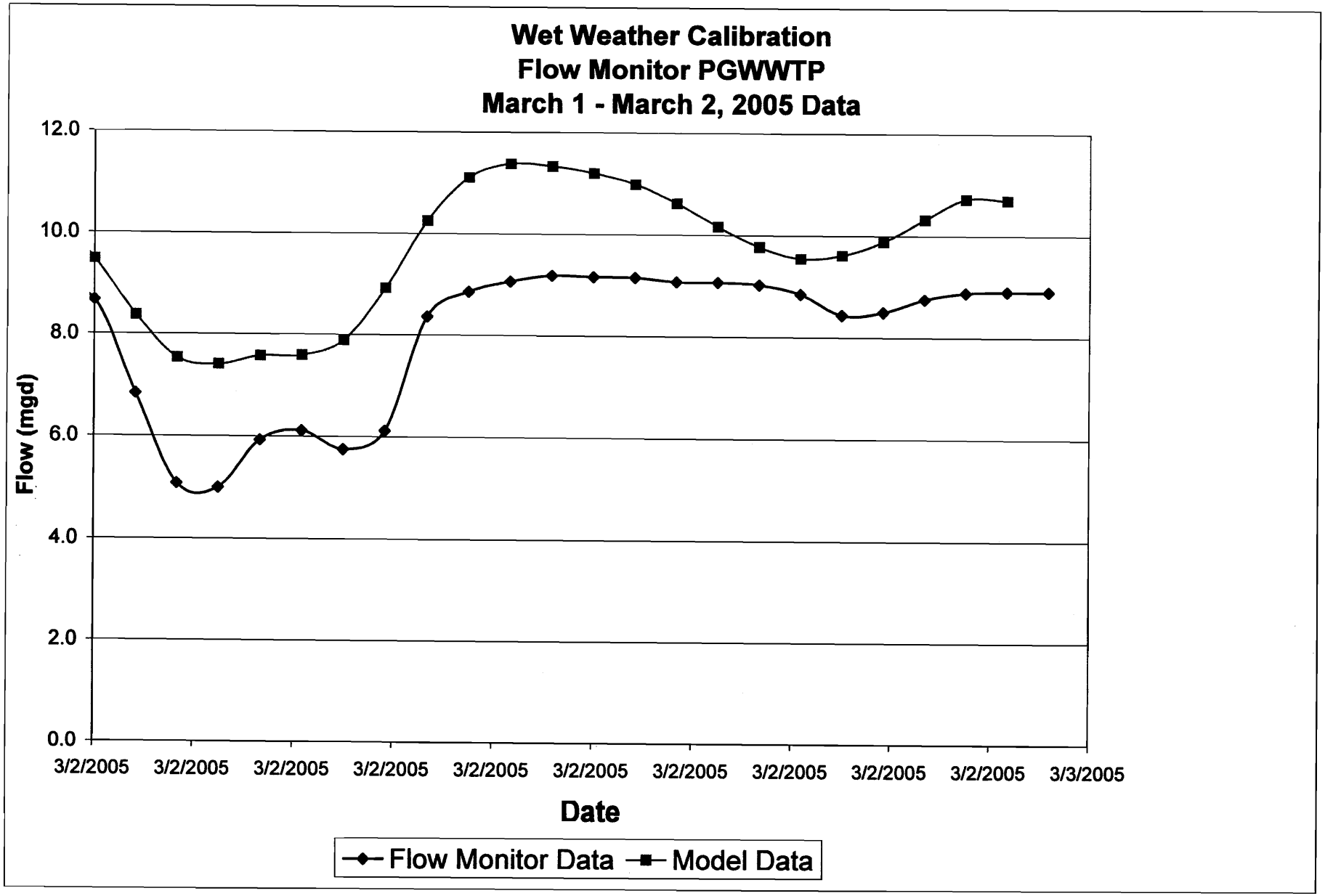

Wet Weather Calibration
Flow Monitor NRRAD
March 1 - March 2, 2005 Data
Model Run
Flow Data
Flow (mgd)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/3/2005
Date


Wet Weather Calibration
Flow Monitor Old Auburn
March 1 - March 2, 2005 Data
Model Run
Flow Data
Flow (mgd)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/3/2005
Date


Wet Weather Calibration
Flow Monitor Strap Ravine
March 1 - March 2, 2005 Data
Flow (mgd)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Flow Data
Model Run
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date


Wet Weather Calibration
Flow Monitor Springview
March 1 - March 2, 2005 Data
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Flow (mgd)
Model Run
Flow Data
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/1/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/3/2005
Date


Wet Weather Calibration
Flow Monitor DCWWTP
March 1 - March 2, 2005 Data
25.0
20.0
15.0
10.0
5.0
0.0
Flow (mgd)
3/1/2005 0:00
3/1/2005 4:48
3/1/2005 9:36
3/1/2005 14:24
3/1/2005 19:12
3/2/2005 0:00
3/2/2005 4:48
3/2/2005 9:36
3/2/2005 14:24
3/2/2005 19:12
3/3/2005 0:00
Date
Flow Monitor Data
Model Data


Wet Weather Calibration
Flow Monitor PGWWTP
March 1 - March 2, 2005 Data
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10.0
8.0
6.0
4.0
2.0
0.0
Flow (mgd)
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/2/2005
3/3/2005
Date
Flow Monitor Data
Model Data